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THE AUTOMOBILE

9TH ANNUAL BOSTON SHOW

FIG. 1—VIEW OF ONE CORNER OF MECHANICS' HALL, BOSTON, SHOWING THE SCHEME OF DECORATION

BOSTON, MASS., Mar. 6—Making a new mark for size, value, popularity and importance in New England and perhaps in the world, the Ninth Annual Automobile Show opened Saturday night in Mechanics' Hall with overflow into Horticultural Hall to accommodate a number of exhibits that could not find place in either of the other immense rooms.

The aggregate space used is 126,000 square feet, one-quarter larger than any previous show the world has ever known. There are 98 varieties of pleasure automobiles, including four electrics and two types of steam cars. There are 39 kinds of trucks, shown in 94 models and over 400 accessory devices, exhibited by 199 concerns.

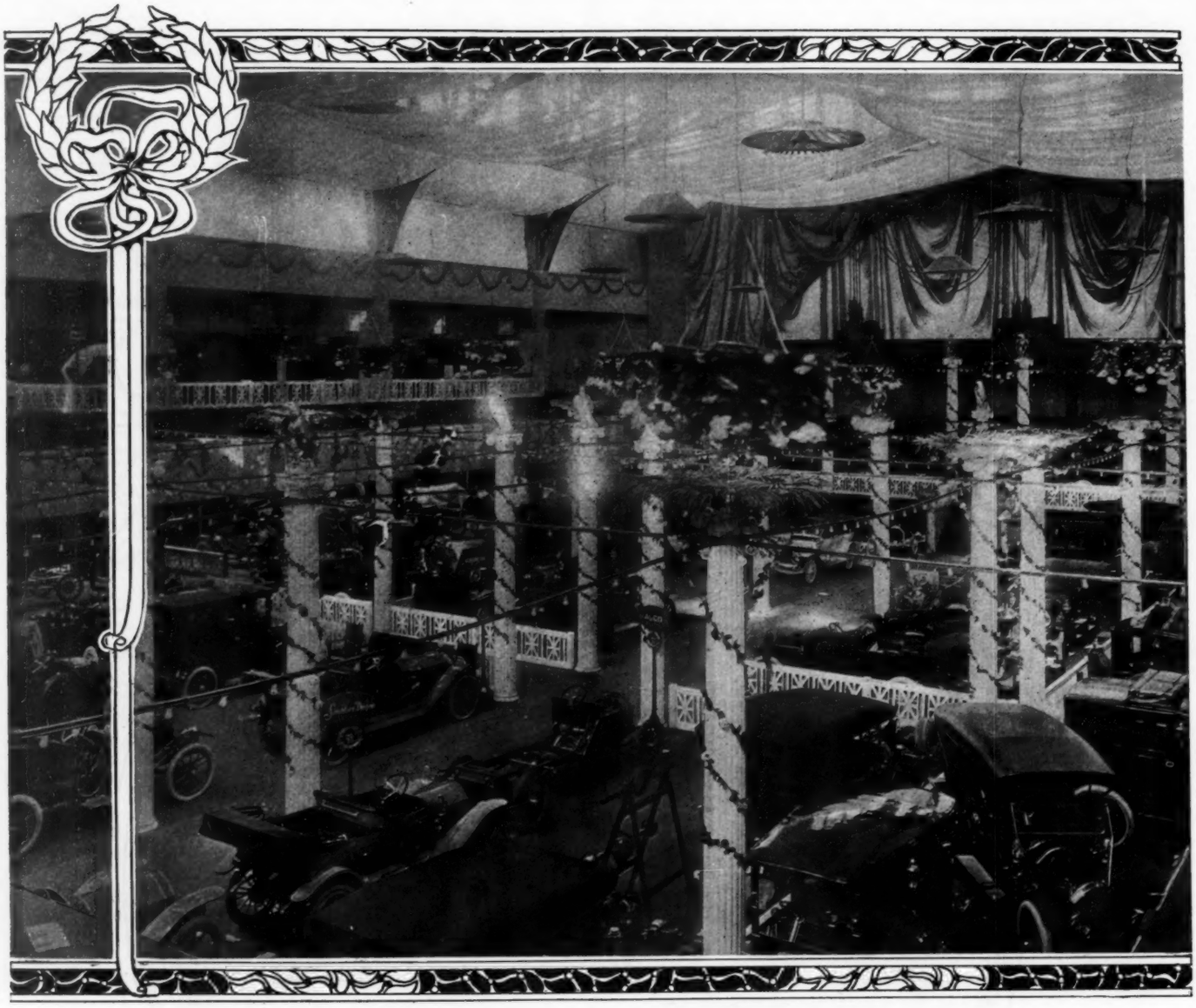


FIG. 2—GENERAL VIEW OF THE BOSTON AUTOMOBILE SHOW LOOKING DOWN FROM THE GALLERY

The attendance on opening night was somewhere in the neighborhood of 30,000 and this afternoon and evening the buildings were jammed from the opening hour until the lights were put out.

The scope of the exhibits is very broad and comprehensive. There are eleven makes of New England gasoline pleasure cars, showing 45 models. There are 28 makes of Michigan cars, led by the Chalmers, Hudson and Packard exhibits according to prominence of space. There are a dozen Hoosier automobiles, such as the Marmon, Premier, Amplex and American, and seven New York factories are represented, headed by the Pierce-Arrow with a full line, Franklin, Maxwell, Cunningham and others. The Ohio delegation consists of ten makes with the Peerless, Stearns, Overland, White, in the more prominent spaces. Every other manufacturing field which turns out first-rate cars is represented and the foreigners are showing four makes. Pennsylvania has a good representation, consisting of six makes, with the Matheson, Pullman, S. G. V. and others on display.

The very completeness of the exhibits makes the task of selection one of considerable labor, but New England goes at a proposition of that kind as if it were the only business before the house. The less solicitation used by the salesmen at the Boston Show the better the results, for the Yankee usually knows what he wants before starting out and the general run of "talking points" does not appeal to him. The usual plan of buying by individuals is simplicity itself. The Yankee decides how much he wants to spend and then inspects, examines and tests until he finds the spot where his money will get him the greatest value for his purpose in exchange. During the process of selection he needs little kept from salesmen except so far as their replies to his searching questions serve to assist him in reaching his conclusion.

In the galleries and upstairs rooms devoted to the display of accessories salesmanship is more in demand and agreeable-voiced, well-dressed men who understand their lines inform the visitors of the merits of their wares with Chesterfieldian politeness. Automobile clothing is exhibited to a larger extent than ever before in this show and tires, ignition, special ties, drop-forgings, pneumatic appliances of eight different sorts, lubricants in profusion, tools, tops, windshields, instruments of a dozen kinds and a host of others are displayed in orderly array. There is a commodious café opening out of the accessory space and the convenience of visitors and exhibitors is well cared for in every way.

There are about 1,600 men engaged by the management of the show and the exhibitors, the latter representing as high-class a

FIG. 3—ANOTHER VIEW OF THE SHOW SHOWING THE LARGE PERCENTAGE OF TOURING CARS ON EXHIBITION

body of salesmen as ever attended an automobile show. As a general thing the head of each display is the president of the concern exhibiting or the manager of the factory branch. Their assistants are the cream of their selling forces and much could be learned by the average automobile salesman by a close study of their methods. They are courteous, willing and pleasing in their address. They are not unduly persistent and only in the rarest instances could there be any just criticism of any of their actions. They displayed an understanding of their visitors that seemed astounding to the outsider and their flexibility and adaptability was a pleasure to witness in dealing with all the numerous types of prospective buyers.

It was illuminating to see how the salesmen weighed and estimated each caller and then conformed his replies to the characteristics of the possible customer. If the prospective appeared to know about the cars handled by the salesman the latter kept still and let the visitor do the talking, merely inserting a word when he found it necessary to direct attention to a certain feature of construction, mechanical operation or decoration. On the other hand, if it was a new car that was under consideration the effect of careful study was very apparent in the explanation of the salesman.

The great attendance of the two opening days will continue throughout the week, according to the Boston rule based upon the past and the prediction of those in charge of the show. It is a notable fact that the average patron of the annual Boston event visits the show at least twice during the week. The first night crowd is not typical of the remainder of the show season and like all other first nights was composed largely of those who sought diversion. There was an element of business quite apparent even on the opening night, but on Monday the character of the visitors changed and all over the halls salesmen were busy noting sales or making memoranda of prospects.

To-morrow will be "Military Night" and at various times during the week there will be a "Club Night," "Society Night" and other special sessions. The music is furnished by two bands composed of women players and the programs arranged for the whole week contain a wide variety of selections. The details of managment have been most carefully worked out and there is a smoothness and certainty about everything connected with the affair that speaks well for those who have it in charge. Chester I. Campbell, secretary of the Boston Automobile Dealers' Association, is general manager, as he has been with reference to the two big shows that have preceded the present affair. If any fault can be found with the exhibition it is the fact that it is too large to be grasped with a sweep of the eye.

Fig. 4—Looking down the center aisle, giving an idea of the Colonnade effect

Standing out in clear relief among all the exhibitions of American motordom of the year as the most important to New England and in some ways to the American public as a whole, the Ninth Annual Automobile Show, which opened in Boston Saturday night, is a significant motoring fact.

It means something to the exhibitor to be able to show his wares to the New England public and to make good on his enterprise. It is a severe test, for in order to succeed in New England it is necessary to possess merit of a sterling order. Quality, workmanship and price must be right in order to achieve any considerable measure of prominence. Thus, the very fact that an exhibitor is able to present his line for two or more years at the Boston show indicates that his goods have quality; that they are skillfully manufactured, and the price is equitable. If there are any weak points in his line the severe test that will be imposed by the motoring public of New England will soon develop it.

As a consequence the automobiles shown at the annual display at Boston are notably staunch examples of the motor art. In the three big halls used for show spaces this year there are 385 models on display, representing ninety-eight different makes of passenger cars. There are ninety-four models of trucks and delivery wagons, shown as the product of thirty-nine separate factories, and there are over 200 exhibits of accessories.

Among the display of pleasure cars are to be found all the highest types of American and foreign manufacture with a very few notable exceptions. Practically every make of automobile that has demonstrated its worth and reasonableness of price is represented in one or another of the show places. It has been found that specially preferred position is not essential to at-

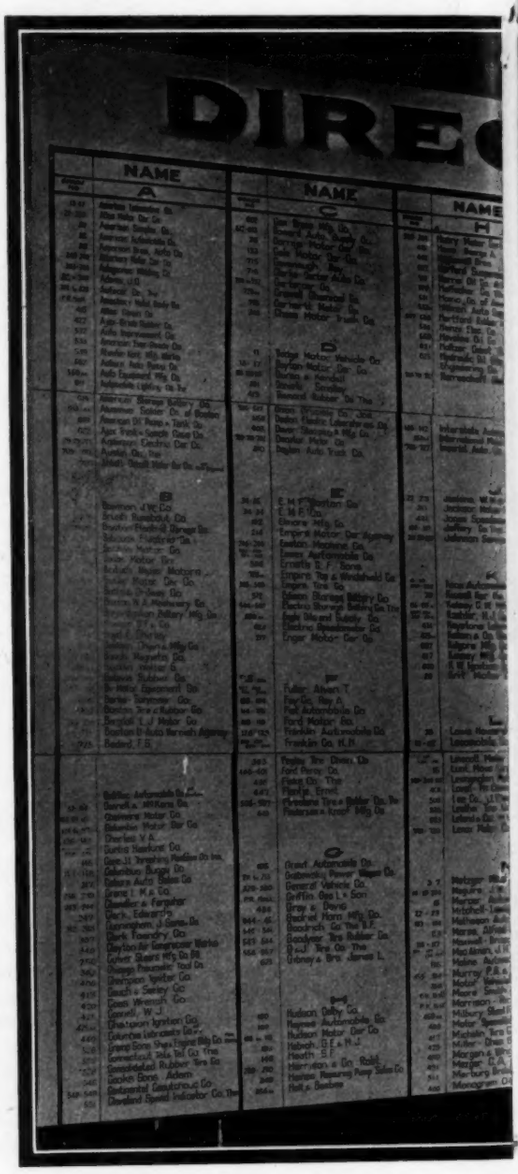


Fig. 5—Directory in the entrance hall by means of which

THE NEW ENGLAND SHOW

The Boston Show is the Ninth Annual Automobile Exhibition held in that city.

It is conducted under the auspices of the Boston Automobile Dealers' Association, of which Chester I. Campbell is General Manager.

It is held this year in Mechanics' Hall, which comprises Exhibition and Grand Halls, with an overflow into Horticultural Hall.

It is vastly larger than ever before, and ranks first in the world in the amount of floor space required to accommodate the exhibits.

The cars shown list at higher prices than those ever offered at any automobile show in the United States.

They represent the lines that have appealed to the Yankee in past years, with a smattering of newcomers.

The show will continue until next Saturday night.

Attendance figures so far indicate a total paid admission of about 175,000.

A WORD ABOUT MONEY VALUES

The list price of all the pleasure cars shown averages $2,106.

The average list price of all American cars is $1,645.

Thus the Boston Show cars each are worth $461 more than the general average price of domestic cars.

The total value of all the passenger automobiles on display is not far from $800,000.

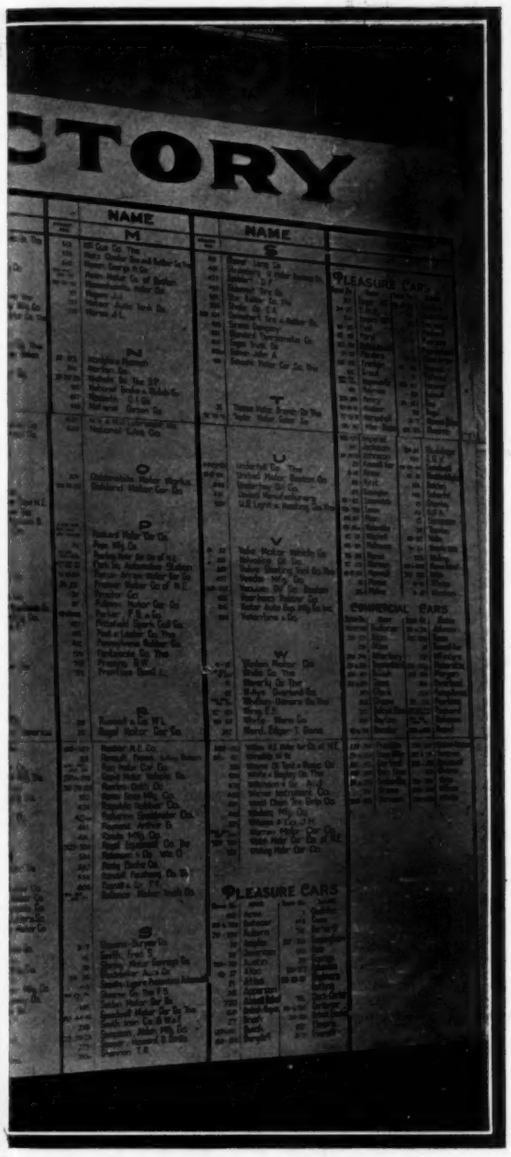
The total value of the trucks is about $250,000.

The accessory exhibits would bring about $500,000.

The total value of the Boston exhibits is in the neighborhood of $2,000,000.

Only two absolutely new makes are displayed: the Lenox pleasure car and the Harrison truck. The Lenox is in Horticultural Hall, and the truck is under Grand Hall.

tract a certain amount of notice at the Boston show, for the New England public is quite as careful in its search for truth and worth in an automobile as it is in other things, and the concerns that were not able to secure space out in the center of either of the halls have learned that those who have determined to make a real examination of the offerings will hunt up



the visitor may readily find any particular exhibit

their exhibits and inspect the models with New England discriminaton, no matter if it puts them to some extra pains.

Of course the exhibit that is fortunate enough to draw a more prominent place is bound to catch the eye of the casual visitor who may or may not have any definite idea of buying a car, but the Boston buyer who has made up his mind that he can spend a certain amount for his automobile may be trusted to inspect every car in the show that comes within the cash limitations that he has set for himself.

The New Englander goes at the purchase of a car with a seriousness that is not nearly so noticeable in other sections of the country. He knows to a dollar how much he will spend before he starts to find the best value for that sum of money. He is influenced by all the traditions of the Yankee, which presupposes the possession of the typical New England conscience and a knowledge of his subject matter that is almost uncanny. The traditions of Yankeedom lead him to hold a fair idea of the value of his dollar and impress upon him the advantage, necessity and duty of securing a fair exchange for his money. The New England conscience, famed in song and story, is a complex affair The blood of the section is based upon that of the Pilgrim Fathers or similar sturdy strains. It has been less changed by the passage of time and the injection of extraneous considerations than that of any other section in the United States. Thus, in the first

NEW ENGLAND CARS AT BOSTON

Practically every well-known automobile made in New England is represented at the show.

Those that occupy blocks in the center of the three halls include the following:

Exhibition Hall—Columbia. In other parts of this section are: Locomobile, Grout, Motorette.

Grand Hall—Stevens-Duryea, Knox, Alco and Pope-Hartford. In another part of Grand Hall is the Atlas.

In Horticultural Hall is the Lenox.

In the basement is the Morse.

All told there are 45 models of New England cars on show.

The average selling price of the 45 cars is $3,721.

This is partially accounted for by the fact that there are larger exhibits of expensive cars than those of the low-priced classes.

DECORATIONS AT BOSTON

Paintings showing typical road scenes all over the world are a feature of the decorations of Exhibition Hall.

It required the labor of an army of 500 men for ten days to prepare the buildings for the event.

Green lattice is used liberally to mark off the various show spaces.

Palms and ferns form an important item in the decorative scheme of the three halls.

Grand Hall is paneled nine feet high with red and gold.

Fluted columns with ornate capitals surmounted by golden eagles form a striking element among the beautiful features of this section of the show.

Aside from the lights and bunting, there is little ornamentation in the galleries or basement.

Fig. 6—View of a corner of the hall showing some car exhibits and a few of the accessory exhibits in the gallery. The lattice work scheme of decoration will be noticed

place the influence of blood is all in favor of honesty and fair dealing. In the second place the climate of New England is rigorous at certain seasons and for generations has caused the inhabitants to lead clean lives in order to survive and as a result the people have not been swayed by the influence of a languorous climate to lose their snap and vigor. It has been demonstrated in New England and elsewhere that honesty in dealing with one's fellow-men is the best policy. So far, the principle is accepted universally, but the Yankee goes a big step further. He believes that he is morally obligated to be honest in his dealings with his fellows, but he also insists that his fellows maintain a similar attitude toward him. He feels that he owes a sacred duty to himself not to take the worst of it in any line of human endeavor and he insists on fair treatment by the most effective means ever devised by mankind. He sets himself up as the judge, jury and prosecuting attorney and tries out the merits of each business proposition as it is presented to him. If his judgment is good, and it generally is, he has a distinct advantage over the man who takes anything for granted. Of course the other man who is lax in his business methods may not always get the worst of it, but the fact remains that the New Englander who follows the system and plays the game properly, according to Yankee rules, is at no material disadvantage, to say the least.

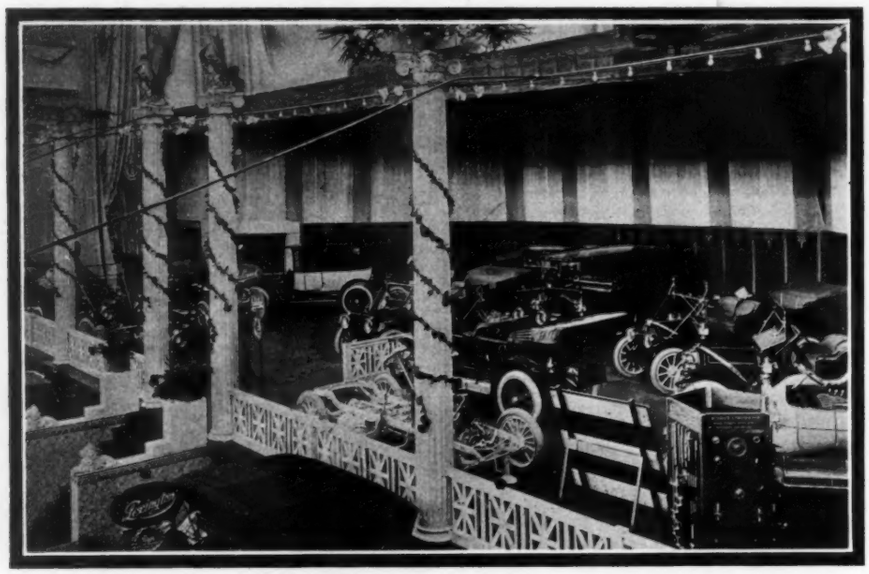


Fig. 7—Looking over the Lexington and Regal exhibits, with the Cadillac in the foreground in the gallery and the Packard in the background

Fig. 8—Headquarters of the Acme and S. G. V. cars as exhibited by the Boston Motor Company

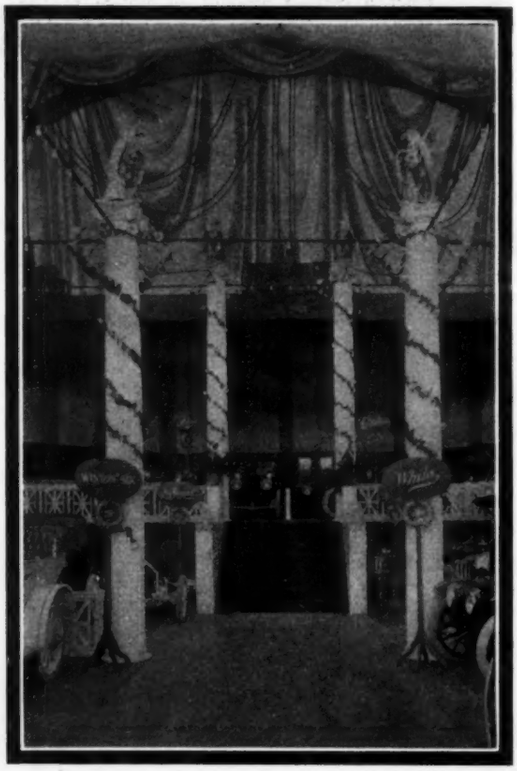


Fig. 9—One of the most interesting points in the exhibition, showing Winton, White, Regal, Lexington, Packard and Cadillac

Then, again, New England never was a Bonanza country. Every element of wealth has been wrung from a refractory soil by strenuous effort. Nobody ever got rich in New England overnight by legitimate methods and the general prosperity of the people has been gained through earnest work and careful saving. It has been a case of slow accumulation and legitimate methods opposed to the more spectacular practices of other sections.

But the Yankee has money in plenty.

STATISTICS OF THE SHOW

The total number of exhibits is 336.

These are divided into 98 kinds of passenger pleasure automobiles, 39 makes of commercial trucks and delivery wagons, and 199 accessories.

The floor space used totals 126,000 square feet, about one-quarter larger than the whole show space of the late display at Madison Square Garden.

It is over 20,000 square feet greater than the combined space of the two buildings used at Chicago.

The show is one-third larger than it was last year in every material factor.

There are eight distinct sections of the display. Pleasure cars are shown in the three main halls alone, except for a few that are exhibited in the basement with the trucks.

Fig. 10—One of the general views, with the Mercer car in the foreground and Stevens-Duryea in the background

He has wrung it from the bosom of his beloved land and he respects New England so highly that he may be relied upon with implicit faith to get value for every dollar of it.

This year trade has been slow throughout the section. There has been some complaint from automobile dealers that sales have not been lively. But it has always been noted that business in the line of local sales has invariably picked up rapidly after the annual Boston shows. It may be that the New England motoring public decided to wait a little after the rendition of the Selden decision before placing car orders.

This seems to be quite a reasonable view of the case when the tremendous attendance opening night is considered and the early rush at the gates to-day demonstrated beyond any question that the show is going to draw crowds of unprecedented size throughout the week.

There is little of vanity in the spectacle presented at the Boston automobile show. Despite the fact that the surroundings are artistic and beautiful and the exhibits of a high order, there is an atmosphere of modesty about the whole affair that is typical of New England. Wild claims and extravagant statements about the decorations and displays are pleasingly absent from the conversation of management and exhibitors and the warmest praise for the event is to be found in the comment of outsiders and visitors who are searching through the host of perfected machines to find something to augment personal convenience or business efficiency.

"Ye shall know the truth and the truth shall make you free" is something more than a high-sounding motto or phrase in New England. It is a command to which the average Yankee bows and obeys and in doing so takes pains to convince himself that it is the truth he has found and then he shakes his limbs to ascertain whether or not the shackles of bondage have been stricken from him.

WHY THE BOSTON SHOW IS A SUCCESS

It is a trade exhibition conducted by and for the trade.

The motor trade of Boston is a model of useful organization.

"Live and let live" really means something to its members.

Stability is its keystone and Harmony is its keynote.

The dealers also have New England consciences in Boston.

Nobody is looking for the worst of it in New England; consequently the chances of giving the worst of it to others is reduced to the minimum.

Then, again, nobody wants to do the latter; the motive being that it is more decent to retain respect than to secure a few doubtful dollars.

When a man enters upon a Boston agency he believes he is to be a permanent fixture of his company.

There are men in the trade who have not changed connections in over ten years.

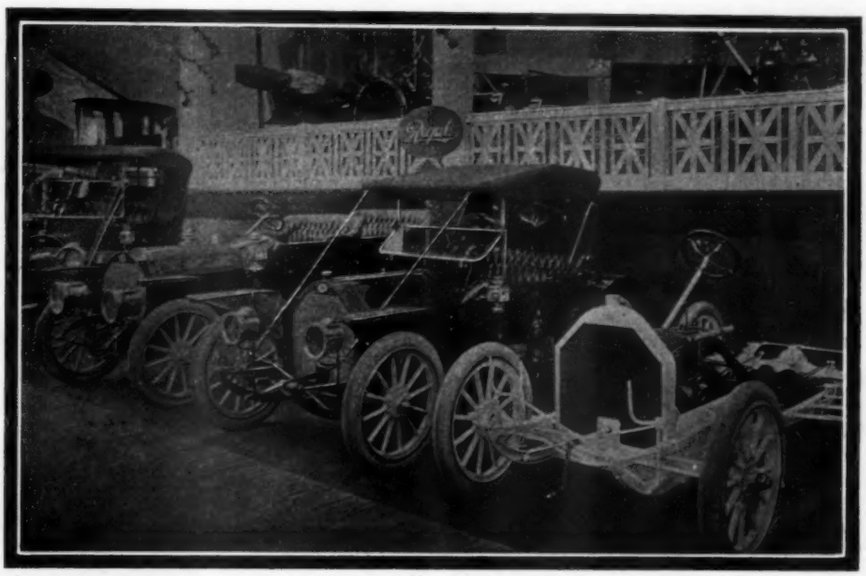


Fig. 11—Presenting the line of Regal cars, with the underslung type to the right and the remaining models strung out

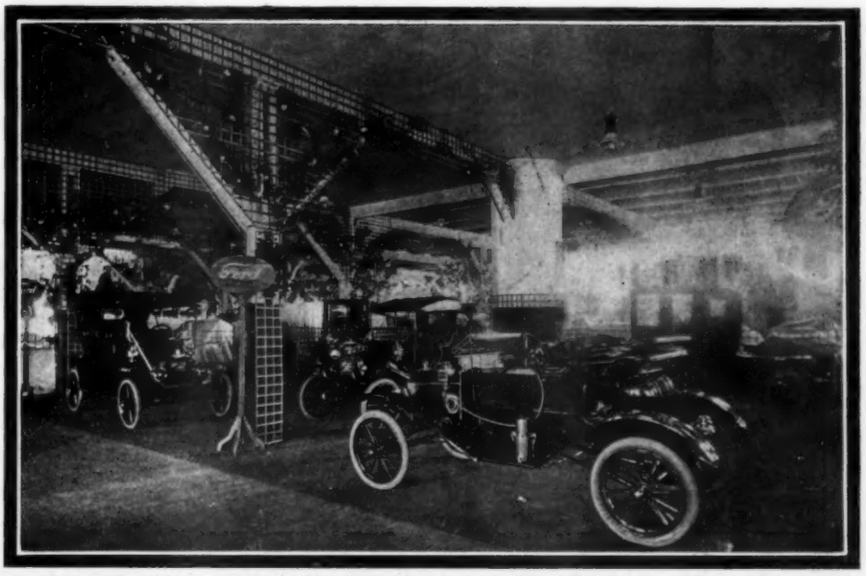


Fig. 12—Presenting the Ford cars, with a doctor's rig in the foreground, inside control car at the back to the right, and other Ford models in sight

New England at the Show

Scattered throughout the vast floors upon which the cars are displayed and bunched in the center of Grand Hall are the products of the New England factories. All the well-known and well-tried cars of Yankeedom are shown with a very few exceptions. In Grand Hall the full line of Stevens-Duryea, Knox, Alco, Atlas and Pope-Hartford cars are on display. In Exhibition Hall the Columbia line, Locomobile, Grout and Motorette have prominent spaces and the new Lenox, a Boston product, is exhibited in Horticultural Hall. The Morse, a car that has been made near Boston for seven years in small numbers and which will be more extensively manufactured this year than before, is shown in the basement.

Trucks made by several of the foregoing companies are displayed in the commercial exhibit and one newcomer in the field, the Harrison, has space. The New England passenger automobiles displayed are the highest priced aggregation of cars of similar size ever shown in the United States. The average list price is slightly above $3,700. This astonishing showing is caused by the fact that the number of models of the highest priced cars is much larger than the number of smaller cars displayed. For instance there are only two models of the Motorette and there are seven big Stevens-Duryeas and six Knox models.

New England trucks also follow the lead of the passenger cars in high-class and price and average considerably more per car than the general run. In the line of accessories, the factories of New England are probably in majority at the show. There are 199 concerns showing accessories and the count, excluding trade publications and extraneous matter not directly related to the automobile, is 86 for New England and 84 for the country at large.

By far the most attention is being paid to the pleasure cars. A constant stream of interested visitors wends its way into each booth and the inspection is conducted on very thorough lines. The Yankee cars attract an immense amount of attention, particularly where sectioned engines form a part of the exhibits. In the Stevens-Duryea booth there is an engine with the cylinders all opened for inspection and the valves cut out so that the action of the pistons, the energy of the crankshaft, the firing and timing and in fact the entire operation of a six-cylinder motor can be seen in every detail except the carburetion and compression of the firing mixture.

This exhibit is surrounded by interested spectators throughout each session. The Vanderbilt Cup Alco is likewise a popular exhibit, being a product of New England and an object of considerable local pride.

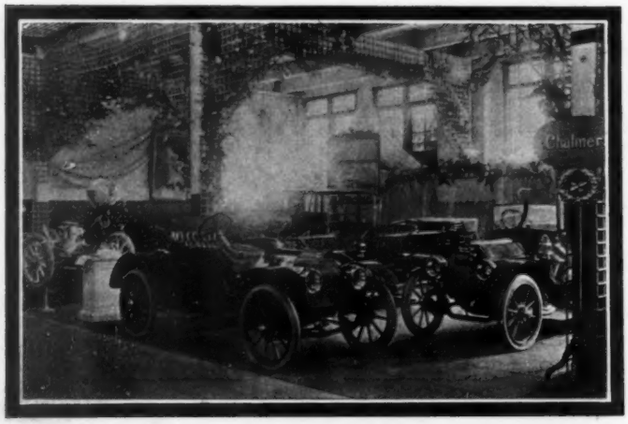


Fig. 13—How the Chalmers cars were displayed, showing fore-door models in the front and centrally, with a Hudson "33" in the right background and the Thomas cars holding a prominent position at the left, with a chassis of this make on an exhibition frame

The New England example of the two-cycle automobile, the Atlas, is also in Grand Hall and a businesslike line of these cars are prominently displayed. The Knox and Pope-Hartford exhibits are limited to the regular stock models, ranging from runabouts to limousines.

The Columbia display, which is made by J. H. MacAlman, president of the Boston Automobile Dealers' Association, contains nothing that has not been exhibited elsewhere this season. The Locomobile line has for its feature a huge white touring car, picked out with black lines, and also shows a stock chassis, stripped to emphasize its mechanical features. The Grout exhibit consists of two models and the Motorette is showing two.

The Morse cars exhibited consist of two completed cars and a chassis and parts. No material changes have been made in this line since last year save in body design. The car has a four-cylinder, four-cycle motor with bore of 4 5-8 inches and is ranked among the cars of highest price.

The Lenox is a graceful touring car with an engine of over 30 horsepower on the A. L. A. M. rating. In price it also ranks above the so-called moderate-priced class. The production of this line this year will not be large compared with some of the Western companies, but plans for next year are considerably wider.

All told there are 45 models of completed pleasure cars and chassis shown, besides the exhibit of the Stanley steam cars and the electrics. In the truck section 18 commercial cars of Yankee manufacture have space.

The trucks are not so popular at this show as they have been at others, but the amount of interest taken in them is not small. Those who inspect them are practically all buyers or the representatives of big houses which are studying out a solution of the delivery and transfer problem of to-day and the future.

The trucks are separated from the rest of the show by a

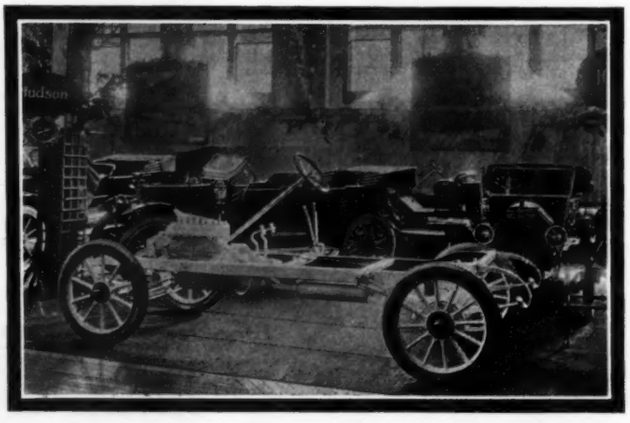


Fig. 14—The Hudson exhibition, with the enameled white chassis in the foreground and a "20" model at the right, with a fore-door touring car bringing up the left rear

flight of steps, and when a man takes the trouble to descend from the region of light and flowers and color, where the crowds are large and where music and talk are insistently present, he is generally on business bent. Thus, despite the difference in the comparative size of the patronage, the exhibitors who are showing trucks have made no complaint. In fact everyone who was asked the question declared that he was in the way of doing some business.

The Decorations at the Boston Show

The Boston show of 1911 is being held in Mechanics' Hall, which includes two divisions, Exhibition Hall and Grand Hall. Above both are galleries and show rooms and beneath a vast basement is filled with interesting exhibits. There is also an

overflow show at Horticultural Hall to accommodate several of the exhibitors who could not be placed in either of the other display rooms.

The total floor space is 126,000 square feet, which is 21,000 more than last year. Compared with Madison Square Garden or the Chicago show buildings, the space occupied by the Boston event this year is about one-quarter greater.

Exhibition Hall, with its triangular addition is decorated in unique fashion. The greenery, palms and lattice work and the bunting, which is sparingly used, are all formal enough, but around three sides of the hall there are ranged a series of oil-paintings showing bits of road scenes in all parts of the world. These paintings were reproduced by Boston artists from photographs and the story they tell is of the universal use of the automobile.

Opening out of Exhibition Hall is Grand Hall, a huge auditorium with an immense stage at one end. The floor is occupied

Fig. 15—Exhibition of the Sampson "35" and the Brush runabout, showing a stripped Sampson model at the left, flanked by a fore-door type of Sampson car and the Brush models occupying a prominent position at the right

with car exhibits from wall to wall and upon the stage and its approaches are shown four types of motor cars. The decorations of Grand Hall are much more sumptuous than those of Exhibition Hall, the scheme being a red and gold panel plan with palms and bunting and a series of ornate Corinthian columns complete a picture that compares favorably with anything in the line of show decorations that has been displayed this season.

Horticultural Hall is not elaborately fixed up for the overflow show, although the building lends itself with much effect to such a display as is made there.

The basement under Mechanics' Hall is plainly decorated with lights and bunting and the galleries, where the very complete line of accessories is shown, are also rather severely treated from the decorative viewpoint.

It is said that the ornamentation of the three halls cost the management $14,000.

Stability—Boston's Watchword

Boston is one of the best fields for the automobile and there are dozens of valid reasons why it should be. The value of the car as a giver of health and pleasure and its use as a convenience have been recognized generally by the Boston public since the earliest days of the motor art. The first crop of automobile factories in the United States was borne by New England soil and along with the general progress in manufacturing and development, the factories located in New England have kept step.

The public that is accounted a customer by reason of ability to purchase is broader in New England than it is in other sections

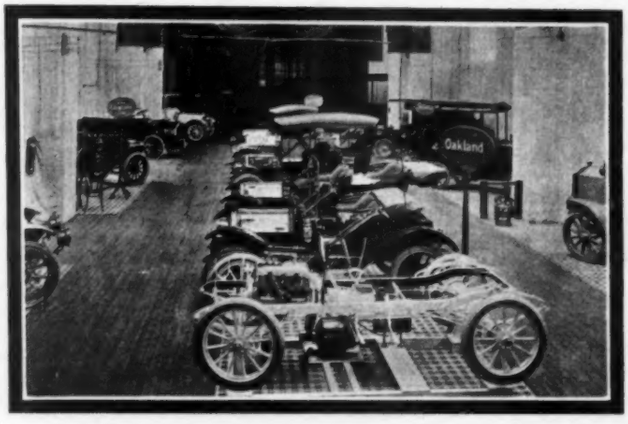


Fig. 16—Where the Oakland is shown, with the Welch and Reliance holding the center position

and the taste and education of this public have been cultivated and fostered longer and more efficiently than in nearly any other big division of the country.

The motoring public of New England believes in Yankee products, but it is not prejudiced against those of other localities. For instance, if an automobile built in New York sizes up to the standard of one built in Connecticut, and the price is a shade lower, the New York car has a chance. But it must have all the quality of the Yankee-built machine at any price to be able to afford real competition. Quality is the factor that turns the scale in New England every time.

In the Boston show there are no New England cars shown that sell between $1,500 and $2,000. Ten out of the eleven makes of gasoline cars are listed at prices ranging from $2,500 up—with the emphasis on the up. All the cars in the moderate size and price class are from outside sections and several of them have found a great field in New England, free from the competition of local factories. Michigan cars coming within these limits are the most numerous, but the field is not confined to the products of Michigan. Ohio, Indiana, Pennsylvania, Illinois, New York and Wisconsin, with a few from other states, furnish a large number of medium-priced cars that find market in New England through factory branches or local agencies.

There is a spirit of harmony and understanding among the members of the Boston trade that works for stability of the industry and success in business. As has been noted before, the celebrated New England conscience is the general birthright of every Yankee, natural-born or transplanted from some less favored section. It is supposed to be a heritage that is as free to the New Englander as the air he breathes and naturally enough the members of the trade come within this classification and each

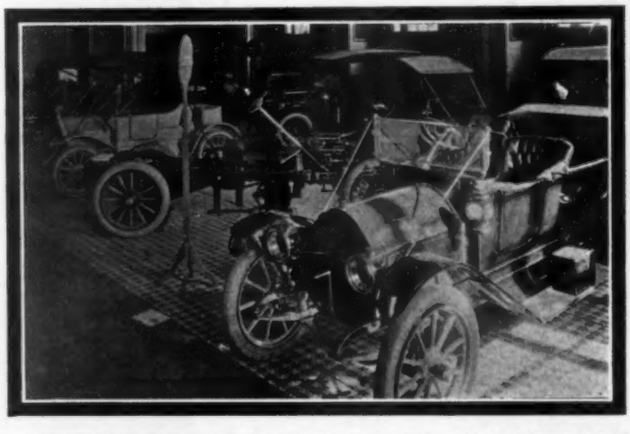


Fig. 17—Exhibition of the Cartercar, with a fore-door type of touring car in the foreground, and numerous other models making up the squadron

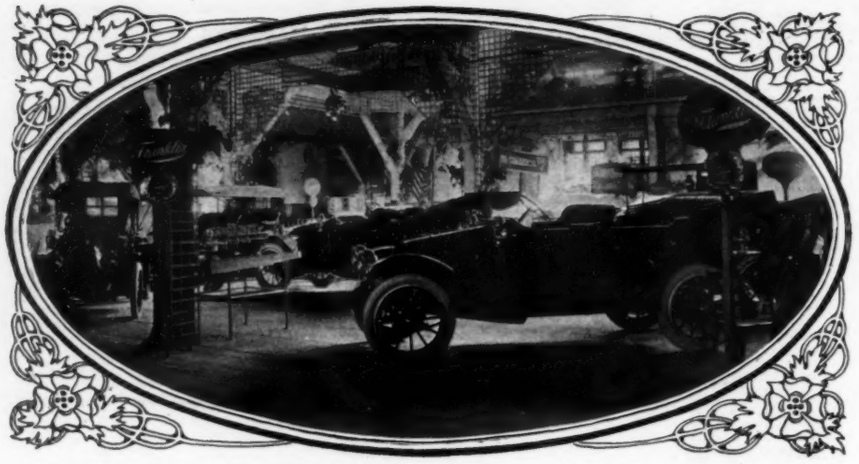


Fig. 18—Exhibition of the Franklin cars, presenting a fore-door model of touring car fitted with a top in the foreground, and other Franklin models at points of vantage

possesses one. Along with the conscience goes a certain depth of education and a due consideration for the rights and privileges of others.

With this foundation it is not strange that the organizations of the Boston trade are founded upon a firm basis and have proved themselves to be remarkably efficient. In the first place, treating the trade as individuals it is found that the service of the Boston automobile agent or the manager of a Boston branch house is on a permanent level. When a man becomes the agent or manager of a Boston automobile concern he must have proved his ability and fitness, or he never would have reached such a station. When he has arrived at the head of one of these establishments he usually remains as long as he pleases, without interference from headquarters.

There are to-day in the Boston trade men who have held the same agency for over ten years. There are dozens of them who have done so for eight years and scores who have retained their present positions for six years. The factory branch representatives change on an average of once in five years, but in the future their term of office is likely to be longer. Permanency and stability are the cornerstones of the Boston automobile trade. Members of any trade have certain elements of common interest and in motordom that principle has long been recognized in Boston. It is related of one veteran member of the Boston Automobile Dealers' Association that he related an unusual eulogy upon another member several years ago at one of the annual dinners of that body.

It appears that there had been some personal friction between the veteran and the previous speaker at the function and that in the course of the other man's remarks, he had taken occasion to say in referring to the veteran: "Yes, gentlemen, even though the veteran may be as old as Methuselah, yet will I do thus and so under such and such circumstances."

It seems that the speaker, while considerably younger than the veteran, was not in good health, owing to a variety of causes; was deaf and did not have the best of eyesight.

The veteran, on the other hand, was a fine specimen of a man despite his years and had all his senses unimpaired. There was a flash in his eye when he arose to reply, but instead of shooting in a poisoned barb of speech, he smiled genially and said:

"It is true that my hair is silvered and I am too heavy to ride as I did when I was with Sherman's column, but I ask no consideration on that account. I agree with my friend, the previous speaker, that 'business is business,' and invite him to follow

MEMBERS BOSTON AUTOMOBILE DEALERS' ASSOCIATION, INC.

Boston Motor Co.
Bowman & Co., J. W.
Buick Motor Co.
Butler Motor Car Co.
Cadillac Automobile Co., of Boston
Curtis-Hawkins Co.
Connell & McKone Co.
Dodge Motor Veh. Co.
E. M. F. Boston Co.
Fiat Automobile Co.
Ford Motor Co.
Fuller, A. T.
Faye Co., Roy A.
Habich Co., G. E. & H. J.
Interstate Auto Co.
Jenkins Co., W. M.
Kissel Kar Co.
Linscott Motor Co.
Loco Co., of America
Lowe-Howard Company
MacAlman, J. H.
Maguire Co., The J. W.
Morse & Co., A. C.
Nichols Co., D. P.
Park Sq. Auto Co.
Parker & Co., F. R.
Peerless Motor Car Co.
Premier Motor Co.
Rambler New England Co.
Russell & Co., W. L.
Rawles-Cobb Co.
Smith, Fred S.
Thomas Mo. Br. Co., E. R.
Underhill Co., The
United Motor Boston Co.
White Co., The
Whitten-Gilmore, The
Wing, F. E.
Winton Mo. Car'ge Co.
Whitney, C. F.
Underhill, A. P.
Fay, C. E.
Campbell, C. I., Secretary

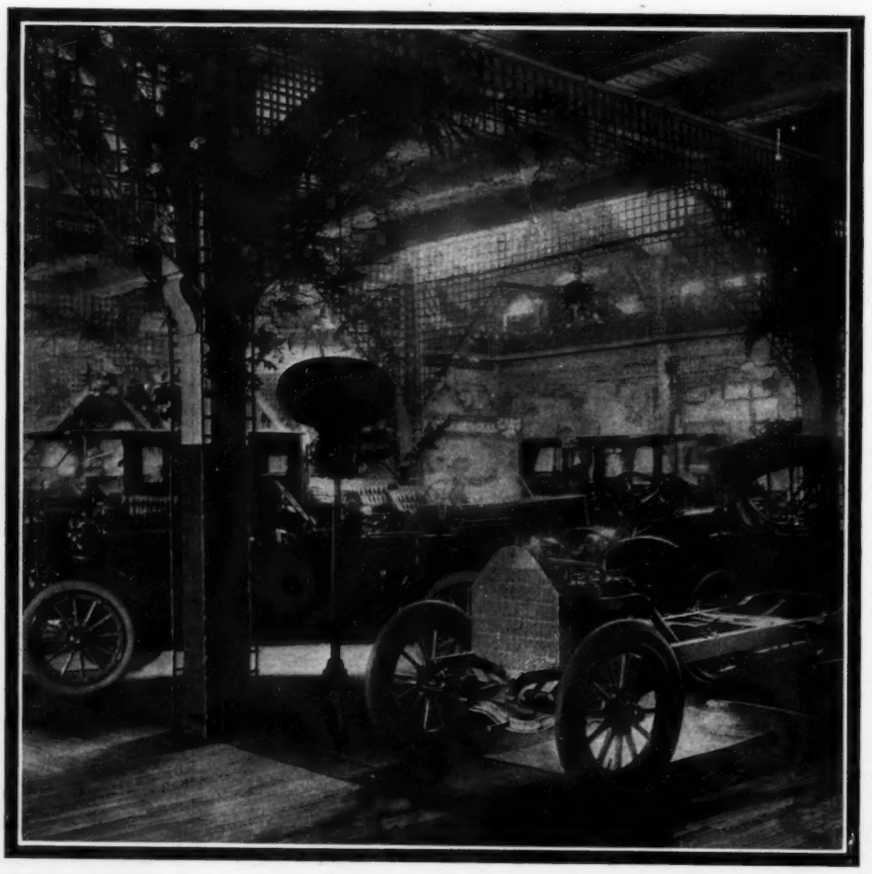


Fig. 19—Exhibition of the complete line of Columbia models, with a stripped chassis in the foreground and a doctor's rig at the left, with a limousine in a prominent position

his own line of action. I bid him have no fear for me on account of my age and if in the fullness of time I may be called upon to make the memorial address over him, I wish to assure him that there will be no bitterness, and in the words of the poet, I shall be:

'To his virtues, very kind;
To his faults, a little blind.' "

The effect of the speech was to produce a roar of laughter at the expense of the first speaker who immediately saw his mistake and extended the hand of fellowship and joined with the others in wishing long life to the veteran.

And it is in this way that the automobile trade settles its little differences that might well lead to a rift that could easily prove fatal to the organization. Like everything else that has human origin, the Boston Automobile Dealers' Association is mortal and subject to the errors of mortality, but throughout its existence it has displayed a typical New England understanding and so has avoided many of the pitfalls that are so frequent in the course of the trade in other places.

There is nothing Utopian about the attitude of the trade. It is on precisely the same basis of competition that it is anywhere else, but it seems that the members have discovered that it is just as easy and successful to avoid petty bickerings and misunderstandings as it is to cultivate them.

Fig. 21—View of the Chalmers and Hudson exhibitions looking from the gallery; also showing the scheme of decoration

In fact they say that instead of helping business, minor unpleasantnesses in the trade tend to hurt it, not only by whatever direct action may be taken in pursuing a quarrel, but also from the fact that it diverts attention from business.

In a section where the buying public is "motor wise," as it is in Boston and New England generally, a united trade is more likely to do a satisfactory business than one that is handicapped by bickerings and factional squabbles.

Therefore, while, of course, it will never come about that any large section of trade, such as the automobile business in any considerable community, will be conducted without personal frictions on account of the varying interests, harmony has been welcomed and made part of the constitution, and by-laws and earnest effort have been made to provide against unnecessary disputes.

The fact that the customers are educated New Englanders is sufficient reason for an earnest effort to satisfy them and such effort is scarcely possible if the dealer knows that the customer may be related to a rival member of the trade with whom he has an unreasonable quarrel. The universal tendency in Boston is to attend to one's business with every faculty alert, six days in the week. Motordom may press this

Fig. 20—Showing Knox automobiles, with the various models strewn about to the best advantage and a motor on a stand in the mid-position

MEMBERS BOSTON MOTOR VEHICLE DEALERS' ASSOCIATION

J. W. Maguire	Pierce-Arrow
A. P. Underhill	Knox
J. H. MacAlman	Stearns
Carroll Doubleday	Peerless
C. J. Andrews	Moon
P. R. Curtis	Victor
C. E. Habich	Hart-Kraft
J. H. Johnson	Buick
L. B. Butler	Rapid-Reliance
G. A. Patten	Reo
J. A. Murphy	Chase
J. S. Hathaway	White
A. B. Henley	Frayer-Miller & Randolph
V. A. Charles	Inter-State
O. C. Lawton	Franklin
J. L. McKone	Overland
C. F. Whitney	Alco
F. A. Hinchcliffe	Winton
E. A. Gilmore	Chalmers
C. W. Malley	Studebaker
A. T. Fuller	Packard
E. P. Blake	McIntyre
F. W. Blackmer	Gramm
Dey Baker	General Vehicle
H. L. Exstein	Grabowsky
F. R. Robbins	Atterbury
H. M. Doane	Warren-Detroit
A. B. Cumner	Autocar
G. P. Bennett	Frayer-Miller
Paul Curtis	Victor
Robert Harrison	Harrison
J. P. Woods	Garford

limit a little, but if there is anything certain in business, it may be said with confidence that the Boston dealer works earnestly with his own affairs as long as they require it and if he happens to have a little time besides it is not exceptional if he helps his brother dealer.

The dealer who receives the help would be the first to object if he thought that the helper was sacrificing himself and his interests to assist him. Thus there is a fine feeling of co-operation that permeates the whole motor atmosphere in Boston. And it is more apparent than real, because the trade knows that neither side would give or receive what was likely to be of vital value.

It is the little things that count after all. Big, broad business on a competitive basis does not come from favor or assistance; it is the unerring result of bringing buyer and seller together on a basis that is satisfactory to both, which is scarcely a matter of favor if it has any considerable volume.

But the conditions surrounding business may be made much more pleasant by a nice regard for the rights of others.

The Boston Automobile Dealers' Association has a younger brother in the field of motordom. This is the truck association which was formed recently to handle and promote the growth of the commercial truck. This organization is conducted on similar lines to the older body and to a considerable extent is composed of the same members as the dealers' body. At the show trucks form an important section of the display and as a consequence the truck association is interested in its success.

The dealers' association is largely identified with the Bay State Automobile Association, although its connection is entirely individual and not corporate. For instance, J. H. MacAlman, president of the Boston Automobile Dealers' Association, is a member of the truck association and a leader in the Bay State Automobile Association. E. A. Gilmore is president of the Bay State and a director of the dealers. Thus the interests of Boston motordom are interlaced in a peculiarly intimate fashion.

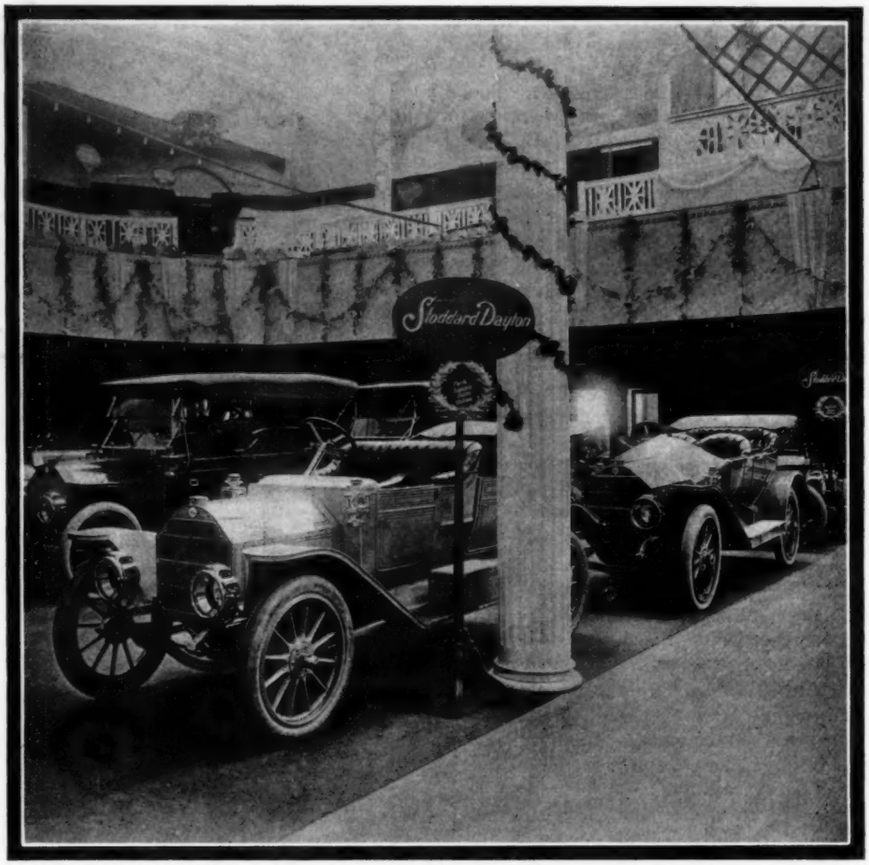


Fig. 23—Where the Stoddard-Dayton automobiles hold forth, showing fore-door models in variety, with a full line of cars under the auspices of the Park Square Auto Station

"An Army Moves on Its Belly"

The Idea Was to Induce the Army to Use Its Brains Instead of Its Belly in Furthering Its Plans

Fort Du Pont, Del., March 6, 1911.

Editor The Automobile:

Dear Sir—I note your article in the March 2 number of The Automobile under the caption "Coming Events Cast Their Shadows Before Them." Come, shift your gear, for you know perfectly well that you cannot hope to take a long steep hill by a rush at it on the high.

In the main your idea is right. The army does need automobiles, but not for cavalry. For cavalry they need the best of horses, and for that reason the breeding of good cavalry horses is an excellent move, not only for the army, but indirectly for the automobile trade.

An army moves on its belly. The ancient Romans knew this when they styled their baggage the impedimenta. In other words, an army can move no faster than its baggage and food supply.

If a good cavalry horse can be had that will travel 30 miles per day in place of 20 as an average it means that the transportation for the supplies must go some other way than by the mule. Wagon trains are the drag on progress. I know, for I have traveled many thousands of miles on foot, and horseback, in summer and winter periods in tropical and temperate zone with the army.

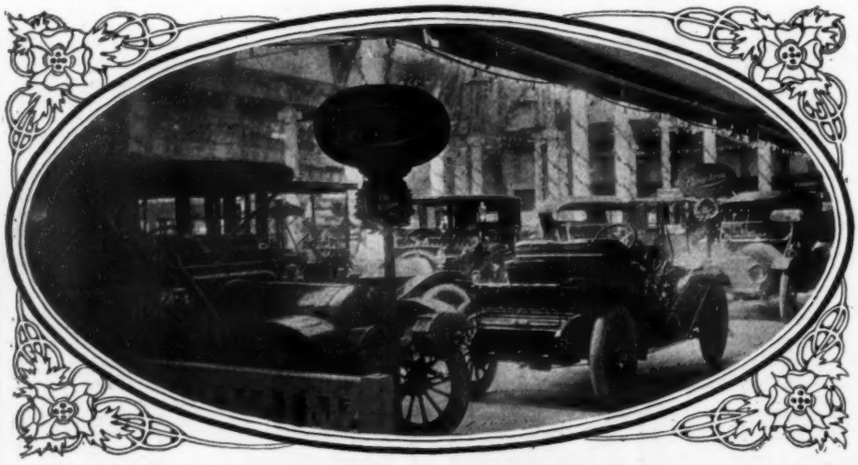


Fig. 22—Pierce-Arrow automobiles shown under the auspices of the J. W. Maguire Company, with a roadster model in the foreground

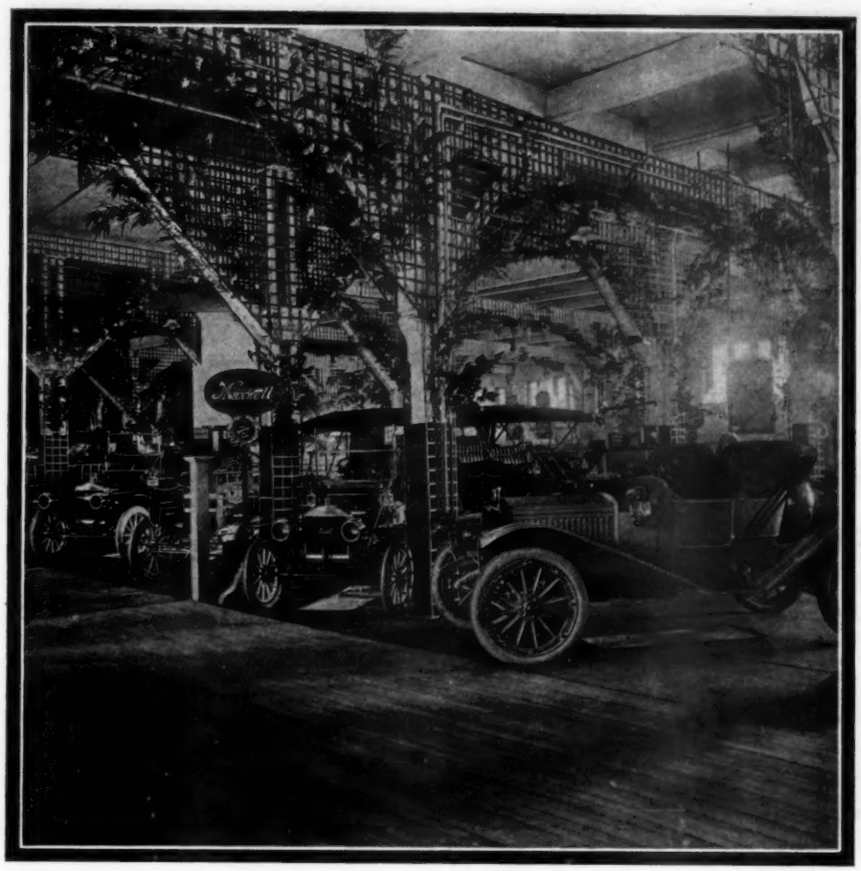


Fig. 24—Maxwell automobiles, with a profusion of models and the foreground occupied by a fore-door type of doctor's rig fitted with a top

If it is desired to educate the army to the automobile it will be necessary to show it, in detail, the advantage of an automobile under all conditions. We are all "from Missouri" when it comes to being shown.

As I said before the army needs better transportation facilities and if the A. L. A. M. would design and submit for trial at the maneuver camps such trucks as would pull in dry and wet roads in the mud holes of the tropics, and the alkali bogs of the West, there is no doubt that some machines would soon be in use.

The automobile will also be useful in transporting bodies of troops from one portion of a field to another where good roads are to be had. But good roads are necessary and if you have traveled the country as much as I have you know the West is most woefully lacking in that respect.

I drive an automobile and I know that it is sometimes necessary to use a horse to get a machine out of a mud hole. It would not look well to have automobiles, and to carry mules along to be used in pulling machines out of the mud.

Your idea is correct in that the army should have machines, but get your "anti-skids" on and shift gears for a long hard climb.

Good roads are needed most and in that regard the automobile has been of great service to the army. If the army gets machines it will be of great service to the good road movement, for when they begin to stick in the mud, and break springs on so-called roads, there will go to headquarters a kick that will result in the government taking a very active part in good road appropriations.

The automobile manufacturers should design machines to stand the worst of usage and use united effort to have them tried out. That effort should be with the part of the government that holds the pursestrings rather than with the army.

The editors of automobile papers should have data carefully compiled as to the roadability of transportation machines, carrying capacity, road space compared with horse transportation, relative economy and ease of getting repairs, compared with getting new mules, etc. A regular campaign of education is needed. A good many more army officers read your papers than you may know about. And the education is not needed entirely on the army, for you may not know that Congress refused automobiles for transportation of all officers in Washington because they were considered a luxury. This "luxury" idea seems to stick with a good many people and must be eradicated by education.

Keep up the work of education, but try solid matter in the place of ridicule and the proper end will be in sight. It won't come easy either, for it will be necessary to prove every step because it is expensive business to equip an army with new material.

I may state that I do not belong to the cavalry, so have no prejudice in their favor.

CAPTAIN L. S. RYAN,
Coast Artillery Corps.

Roads Will Be Equally Bad for all Modes of Transportation.

The points that the above letter disregards, are as follows:

(a) The enemy will not be slow in taking advantage of the fact that we are all "from Missouri."

(b) The enemy will not hesitate to design and submit such trucks as it will have in hand for maneuvering purposes.

(c) The passenger automobiles that officers want for use in Washington, have absolutely no bearing upon the "war game."

(d) Good roads are no more in need for freight automobiles than they are for animal transports. Where a mule can go 10 miles per day in the mud, there are men of experience who think that freight automobiles will be capable of making it 4 times 10 miles per day—good roads, however, are much in need, war or no war.

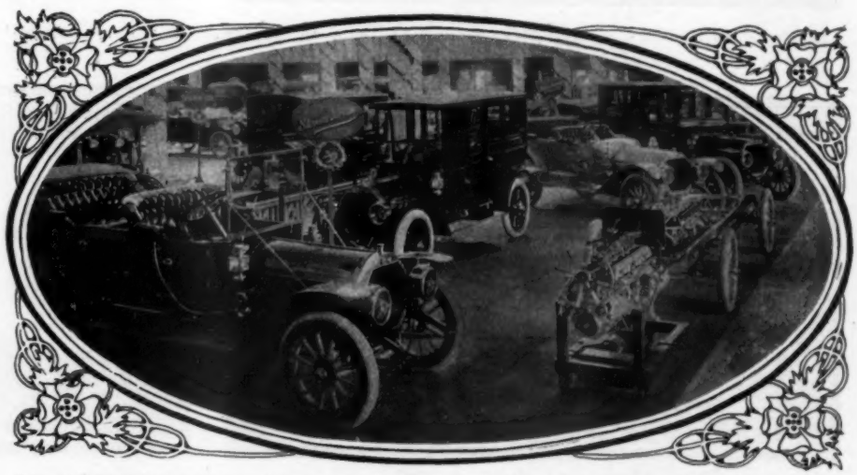


Fig. 25—Presenting Stevens-Duryea cars of the various models, with a six-cylinder motor in the foreground mounted on a truck, flanked by a stripped chassis

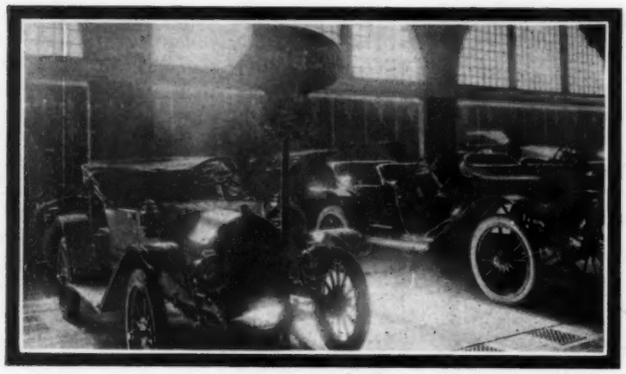


Fig. 26—Exhibition of Atlas automobiles of the various models hailing from Springfield, Mass.

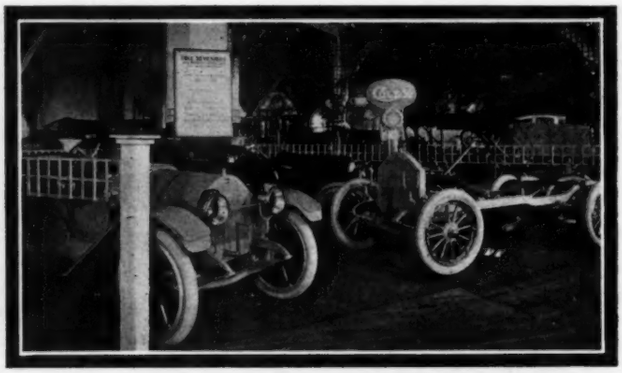


Fig. 30—Cole "30" exhibits, showing a stripped chassis and a neat type of touring car

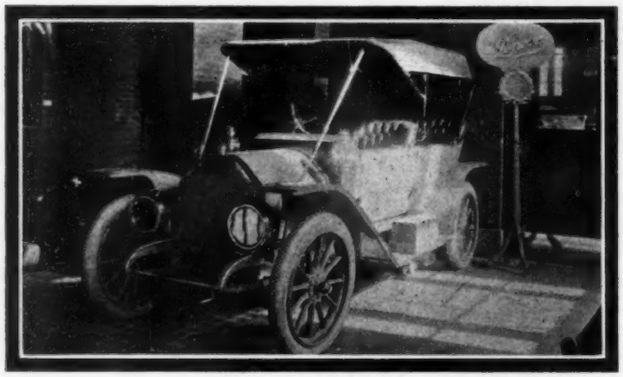


Fig. 27—Where the Lenox car is shown—this is a fore-door type of touring car and this is the first place of its exhibition

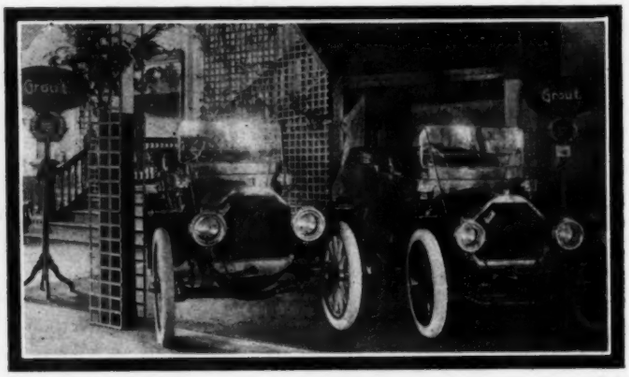


Fig. 31—Exhibition of the Grout, presenting two models representing fore-door types of touring cars fitted with windshields

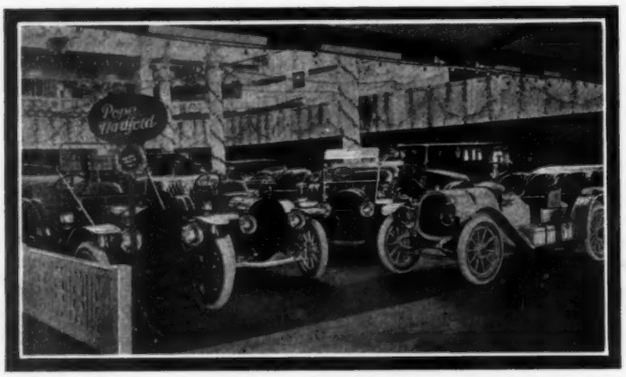


Fig. 28—Pope-Hartford automobiles—enough of them to fill the large exhibition space

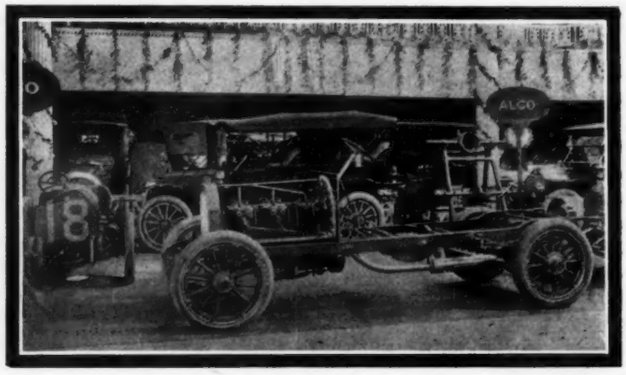


Fig. 32—Alco with a six-cylinder stripped chassis in the foreground and other models of the same make bringing up the rear

Fig. 29—Stearns automobiles on the left side of the aisle and Rambler automobiles on the right side thereof

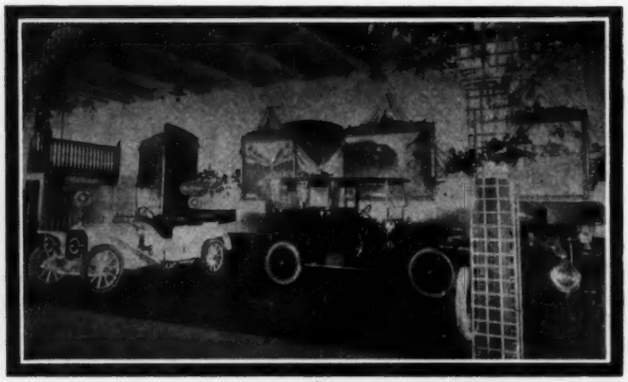


Fig. 33—Matheson exhibit at the Boston show, showing different styles of bodywork

IN THE DELIVERY OF GOODS

Cost of Delivering Merchandise By Freight Automobiles

Mileage realized in every-day service	60
Capacity for goods	10 tons
Mileage under load	30
Ton-miles per day	300
Cost per ton-mile	5 cents

Note: The actual cost with 3½-ton trucks, as shown by the R. H. Macy & Co. figures, is 4.99 cents per ton-mile.

Cost of Delivering Merchandise by Horse-drawn Vehicles

ce of hire of a double ruck, per day	$8.00
Load that can be depended upon (not counting the return trip)	4 tons
Total mileage (average in N. Y. City), per day	11
Load mileage (according to the above estimate), per day	5.5
Cost of hauling, per ton-mile	$0.36

Cost of Man-Delivered Merchandise

Cost of man per day	$2.50
Mileage (Total)	20
Mileage under useful load	10
Burden that he can support daily in pounds	40
Total work done per day, in ton miles	0.2
Cost of hauling by man-transportation, per ton-mile	$12.50

INVESTIGATION fails to disclose the headway that would seem to be desirable referring to the keeping of records of the performance of freight automobiles, but this is not so much to be wondered at when the same investigation also discloses the absence of records of the performance of horse-drawn vehicles. It would appear that much of the talk of how much it costs to transport goods, referring to horse methods, is the veriest rot. For years and years men have been buying and using horses, but they have not tried to find out how much it was costing them to indulge in the pastime. This point is no better illustrated than by referring to the graft that has grown up in connection with the purchase of horses. In very many instances when horses are purchased, the representative of the purchaser is taken to one side and if he comes away from the "fated spot" it is with a $50 bill sticking to his palm! In New York City, where horses are still used by contractors, and a few truckmen, a good span of these animals costs upward of $700 and it is not possible to say of them that they will last for more than four years. It is more than likely that this short life of the animals is lost sight of when estimates are being made.

To some extent, the "superstitions" of the horse-industry are creeping into the automobile business. Bookkeeping is not the forte of the men who are given charge of the work. That the merchants who pay so much for the delivery of the goods they sell, and not know how the money is expended in the delivery process, is beyond belief, and it is to be hoped that in the near future a reform of this important matter will be brought about. There is no reason to doubt that a considerable saving could be realized, perhaps 25 per cent., were the merchants to do a little bookkeeping. Men soon reach the conclusion that there is no occasion to count the small losses. Keep track of the cost of doing the work. Make sure that economy, as it should obtain, is welcome in the establishment.

Simply Ton-Miles

HUMAN CARRIERS AND TON MILES.

Problem: To move 100 tons of grain sacked in 100-pound bags, 100 miles. It would require 3600 men ten days to accomplish the work. This does not take into consideration sickness, collapse and death.. It would cost at least $36,000 to do it in this way.

It would require 1500 men to carry supplies for the burden-bearers and themselves.

It would require at least 100 foremen and officers to conduct the caravan.

The ton-mile cost would be $3.60, which is equal to 1 8-10 miles per pound per mile, or 18 cents per load per mile, or $18 per load for the trip. That would make the grain, worth, say, at the start 1 cent per pound, at least $19 a sack at the terminus of the journey.

The wages of the 3600 men and their keep is reckoned together at $1 a day.

It would require 2000 men carrying 100 pounds each to transport the grain.

SPEED, certainty and economy are the three great considerations in the transportation problem as it confronts commerce to-day, just as they have always been the essential trinity. All forms of transportation are supposed to possess the quality of certainty as a basic characteristic; for if there is no certainty that a shipment will reach its destination sooner or later the system of transportation used does not merit the name.

It is quite certain that a power equal to that of one man is sufficient to move the Pyramid of Cheops.

But such a method of accomplishing a great work would not be economical, judged by any standard of measurement. It would cost too much and it would take too long. Thus, with certainty assumed as the basis of any system of transportation, the other two factors are the real ones to be considered.

The value of speed and its resultant economy in time, which means money, in its relation to the problem of transportation may be illustrated in several ways. Suppose that the particular theorem under consideration is the carrying of 100 tons of grain sacked in 100-pound bags for 100 miles.

At the battle of Chancellorsville during the Civil War, the troops of "Stonewall" Jackson set a new mark in swift movement for infantry, marching a trifle over 24 miles in 24 hours in service formation. A trained athlete, stripped and specially prepared, has walked over 100 miles in a day, but the average strong laborer would hardly undertake to carry 100 pounds more than ten miles in a day if he were trying to keep up the pace for a stretch of ten days. Thus it would require a brigade of 2,000 burden-bearers ten days to cover the route over good roads and under favorable conditions. In addition to the load of 200,000 pounds, they would have to transport tents, bedding, utensils and supplies for the journey. Reckoning the rations at 4 pounds per man per day and the additional equipment at 10 pounds per man, and considering that this supplementary burden was also divided into loads of 100 pounds, it would require at least 1,500 more men to pack the supplies and camp equipment. Then there would be several foremen and a captain of the expedition, say 100 staff and line officers.

Thus the number of men required to transport 100 tons of sacked grain 100 miles would be approximately 3,600.

If such an army could be enlisted for the purpose it would be quite certain that it could accomplish the journey in ten days.

From the viewpoint of economy such an undertaking appears stupendous. Figuring the wages of the men at 50 cents a day and their keep and care at 50 cents a day, the total daily cost of the expedition would be $3,600 a day, or $36,000 for the trip. As the actual freight transported would be 100 tons and the distance 100 miles, the number of ton miles involved would be 10,000, or an average of $3.60 per ton mile. Estimating that the grain was worth 1 cent a pound at the point of shipment, it would have to sell for more than its value at the shipping point $1 per sack with the cost of freighting added, or $18 a sack, thus making the cost to the consumer over $19 a sack.

MOTOR TRUCKS AND TON MILES.

Problem: To carry 100 tons 100 miles.

It would require ten 10-ton trucks to negotiate the business in a single load or caravan such as has been used to compare the efficiency of man with the 1000-pound wagon.

The trucks traveling at the rate of ten miles an hour would require one working day to cover the ground fully loaded.

The trucks would require a driver at less than $5 a day and a helper at about $2.50.

As there would be ten of each, the wages of both would be $75.

The trucks could do more than ten miles each on a gallon of gasoline at less than 20 cents the gallon, or a total cost of $20.

The oil, grease and incidental repairs may be figured at $5 all told.

An elaborate luncheon at noon control might cost $30 and at the end the total cost of the trip would be $130. This is 13 cents per ton-mile.

1000-POUND WAGONS AND TON MILES.

To carry 100 tons 100 miles in wagons of 1000-pounds capacity would require at least 300 wagons; 600 horses and 300 men.

At 20 miles a day, the journey would occupy five days. At $3 a day, the teams would cost $900 a day or $4,500 for the trip.

If the wages of the drivers was fixed at $1 a day the item would total $1,500 on the trip.

The maintenance of horses, wagons and men for the five days would amount to $525 a day or $2,625 for the trip.

The total cost of the transportation by wagon may be estimated at $8,625. This would be at the rate of 86 1-4 cents per ton-mile, or $4.31 1-4 for the freight charges on each sack.

The cost of the grain to the ultimate consumer would be about 5 1-3 cents per pound, if the same basis of 1 cent per pound is used as its original price. This would make bread a luxury anywhere.

Taking wagon transportation, based upon vehicles capable of carrying 1,000 pounds, the cost is much reduced, and the time is improved. It would be necessary to equip the train with 200 wagons of this type, the motive power being 400 first-rate draft animals. Under this plan the wagon train might cover 20 miles a day, thus making the journey five days long. The feed of the horses and the keep of the men on such a trip would be supplemented by that of another army of auxiliaries to carry the supplies; probably more than half as large as the supply train itself. The cost would be at least $3 per day per team, or $900 a day; $1 per day per man, or $300; $1.50 per day for keep of team and man, or $450; and at least 25 cents a day for grease, repairs and incidentals, or $75. On this basis the cost of transporting the 100 tons of sacked grain by 1,000-pound wagons would be $1,725 per day, or $8,625 for the five days, or the whole trip.

That would mean a ton-mile rate of 86 1-4 cents, or an average cost of $86.25 for each ton of freight taken over the 100-mile route. The cost of the grain to consumers at the end of

A Few Statistics to Show How the Modern Motor Truck Measures Up to the Standards of the Past.

the route would be not less than $5.31 1-4 per sack, or a little less than 5 1-3 cents per pound.

If the means of transportation chosen should be 10-ton motor trucks, the caravan would be short as to length and the speed and economy would be vastly enhanced.

Over good roads and under favorable conditions such as have been used for illustration in the two foregoing examples, the problem would be answered by the trucks something like this:

It would require ten machines to carry the freight. They could be loaded and unloaded by the driver and his helper, and traveling ten miles an hour for ten hours, could cover the journey in one day. In neither of the foregoing instances has the matter of depreciation and loss been considered. It is true that heavily-laden men sometimes reach the limit of human endurance, and it is quite likely that among the 3,600 who took part in the first example, some would collapse and possibly there might be some fatalities. It hardly seems likely either that 600 horses and 300 wagons and 300 men could make the second trip without depreciation of value and efficiency. So, for the purpose of illustration, the item of depreciation is assumed to be set off in the case of the trucks, by the sickness, collapse and death of the men, and by the natural depreciation of the wagons, horses, etc., in the second example.

MAN, HORSE AND MOTOR TRUCK.

If the 3600 men used as carriers in the first illustration were placed in 1000-pound wagons, they could accomplish twelve times as much in the same time as the force of 300 drivers could cover.

If they worked as long as they would have had to on foot (ten days) the sum total of their labors would be 24 times as efficient.

If the 300 men required in driving the wagon train were given ten-ton motor trucks and worked five days, they would haul 1500 tons, 500 miles, or fifteen times as much of a load five times the total distance of the test.

If the carriers' army manned ten-ton trucks and worked ten days, the result would show the transportation of 18,000 tons a distance of 1000 miles, or 180 times the load and ten times the distance.

The trucks and crews can do this job in one-tenth of the time needed by human carriers and in one-fifth of the time required by wagons.

On an equal basis, therefore, the cost of carrying the 100-tons by motor trucks would be about as follows:

The pay of the ten drivers would be less than $5 a day, and figured on that basis, would amount to $50. The pay of the helpers would be around $2.50 on a liberal basis, say $25. The machines would consume considerably less than 10 gallons of gasoline each; figuring it at that amount and the cost at 20 cents a gallon, the gasoline bill for the whole caravan would be less than $20. Oil, grease and incidental repairs might make an additional item of $5.

Suppose that the train starts out at 7 o'clock in the morning and travels until noon, and at noon all hands alight and go to the best hotel in town and eat luncheon at a cost of $1.50 per man, the consumer would have to add another item of $30 to the cost of the freight. At 1 o'clock in the afternoon the men would board the machines, puffing the best 10 cent cigars they could find, and whisk away on the other half of the journey. Just as the shades of night are beginning to fall, the head of the caravan appears in the much-abused city that was formerly served with its grain through the medium of human and horse transportation. The score of men are all fresh and rested and the automobiles hum merrily as they swing around the last corner and draw up to the warehouse to which the grain is to be delivered. They have had a big day, but it is an absolute certainty that they are fresher and more active at the end of it than the men who carried the sacks on their shoulders and took ten times as long in covering the ground. By 7 o'clock the drivers and helpers have unloaded the grain and, after washing and dressing, can enjoy their supper.

SPEED, CERTAINTY AND ECONOMY.

Dan O'Leary has been able to walk over 100 miles a day after special training and stripped to the buff.

Stonewall Jackson's army at Chancellorsville covered over 24 miles in one day, setting a mark for army movement never equalled.

A willing laborer might carry 100 pounds ten miles in one day, but he would not. Such work might be done by an army or a slave-driven horde.

Ten days of such work would mean collapse or death to the average man.

Ten motor trucks could do the work of 3600 human carriers in one-tenth of the time they would require and at 1-277 of the cost.

That would be slightly more than one-third of 1 per cent of the cost of the human carriers.

The automobiles could do the work of 300 1000-pound wagons in one-fifth of the time required by them and at 1-66 of the cost, or 1 1-3 per cent.

The cost of the trip would be $75 wages, $20 gasoline, $5 grease, oil and incidentals and $30 for lunch. Thus the cost of the trip would be $130, and even the item of the $30 luncheon might be eliminated. However, as a charge was made for the keep of men and teams in the other illustration, there is a reasonable basis for the item. The caravan has carried 100 tons 100 miles, and the cost has been $130, or 13 cents per ton mile. If the grain was worth $1 a sack at the point of shipment, it could be sold at a profit at the end of the route at $1.65.

In both of the other illustrations the cost of transportation by men and wagons has been minimized, and yet it reaches an appalling total. It is almost prohibitory under any circumstances to carry goods on either basis. It would be better not to have any commerce between points 100 miles apart than to struggle with such mediaeval conditions. In the case of the motor trucks, the cost has been exaggerated, and still the comparison is strikingly apparent. On a basis of strict economy the cost per ton mile using men as the motive power would not be less than $4, with wagons it would be rather more than less than $1, and with trucks 8 cents per ton mile is not under actual figures.

TON-MILE COMPARISONS.

At a ton-mile rate of $3.60 it would cost $10,800 to ship a one-ton automobile by freight from New York to San Francisco.

At a ton-mile rate of 86 1-4 cents the cost would be $2,587.50.

At a ton-mile rate of 13 cents the bill would be $390.

The actual freight rate for shipping a car would be $140.

As a matter of fact, the gasoline, oil, wages, etc., upon which ten-ton trucks can be operated is around 8 cents per ton-mile, which would equal $240 for the transportation of an automobile weighing one ton from New York to San Francisco. Several of the manufacturers declare that this figure is too high.

It would take more money than the world has ever seen to pay the shipping bills for automobile freight alone if reckoned upon the basis of human carriers.

How Department Stores Deliver Goods

Including a Statement of the Number of Freight Automobiles That Are Now in the Service of R. H. Macy & Co., of New York City

DELIVERING a spool of thread to a lady at a distance of 10 miles from the store is the problem that confronts the "department store," and considering the cost of the making of the delivery, allowing that the average cost is 15 cents per package, it is difficult to see how the profit on the spool of thread is enough to enable the owners of the enterprise to cut a "watermelon" more than once in a century. But "department stores" are paying institutions, despite this alarming example of the delivery problem. It must be that some of the profit that otherwise would fall to the lot of a piano makes up for the loss due to the delivery of the spool of thread. The great question is to reduce losses where they occur and diminish the price of pianos accordingly.

At the present time, owing to the mixed use of animal-drawn delivery wagons and freight automobiles, the whole situation is complicated, and in the study of its phases there is a large chance of making glaring mistakes. Not a few of the "department store" managers are beginning to discover that they are not in a position to get at the facts. They find that the men who have charge of the transportation problem are bred-in-the-bone horse-admirers. This is no disgrace; certainly horses have served man most faithfully for decades; surely the horses are to be loved; for that matter who can avoid lavishing affection upon the splendid animals that rank as man's most faithful friends, not forgetting the goods.

Fig. 1—Moeller stake truck for heavy haulage

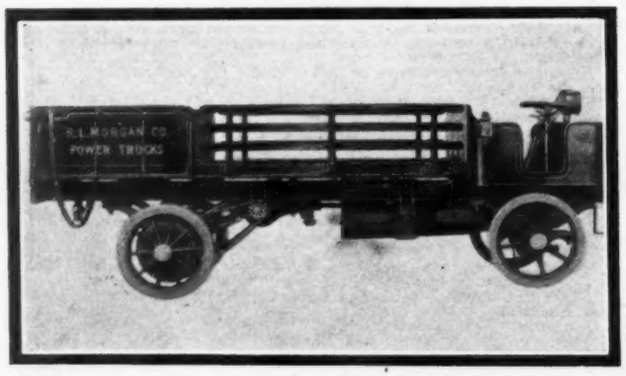


Fig. 2—R. L. Morgan power truck

But the spool of thread must be delivered, and the cost of doing so is now 15 cents. When it is considered that a good spool of thread may be had for five cents it must be admitted that it is a clear case of lavishing affection on the horse, despite the fact that he costs the owner 10 cents for every spool of thread that is delivered under such conditions, and it is scarcely to be

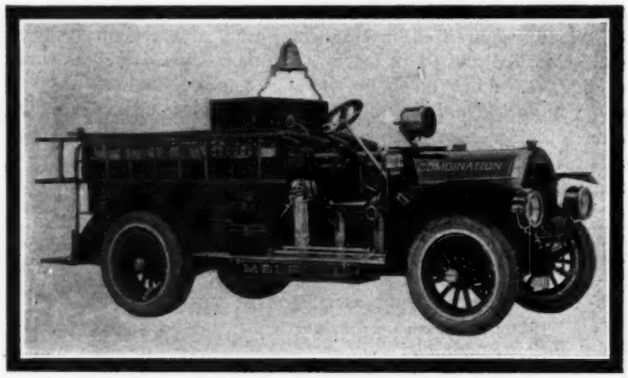


Fig. 3—Knox combination fire fighter

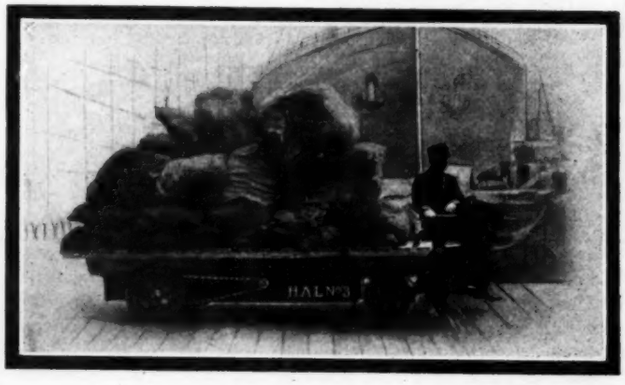


Fig. 4—Lansden dock and station baggage truck

expected that the affection will hold out very long after the merchant finds that the drain is upon his most valued possession—his pocketbook.

In thus selecting a spool of thread as the basis for discussion, it is with the deliberate intention of using an example that will not be too deep for the intellect of the merchant. This may be a cruel thing to do, but merchants show by the tenacity with which they hold to horse-methods of delivering goods that they are not prepared to listen to broader arguments. If a loss may be traced to the delivery of a spool of thread there is a loss to be ascribed to the delivery of every character of merchandise. All that makes this particular example conspicuous is the fact that the loss is 200 per cent. In the delivery of a piano, it may be that the loss is barely 1-2 of 1 per cent. The merchant might also say: "I can tack it onto the bill." But supposing the loss is tacked onto the bill; it is still a loss; the only difference is that the purchaser has to pay the score.

It is a short-sighted policy to make a purchaser pay for the bad management of a company. It is but a matter of time when the purchaser will find a merchant who will have sense enough to turn the account into a profit. True, merchants get nearly all of the income of the average family. Equally true, they would get just the same amount of money were they to manage their affairs so that the purchasers would realize more on the investment. Efficiency is the best investment that anyone can make. The merchant who deals in efficiency is bound to get ahead of his competitor just in proportion as his dealings are more efficient.

Enterprising Merchants Are Making a Study of Efficient Methods of Delivering Goods

The personal equation seems to be the greatest factor that stands in the way of efficient work. The merchant who is in a position to do all the things that come his way is fortunate, in a sense; he will then know how well or ill the several tasks

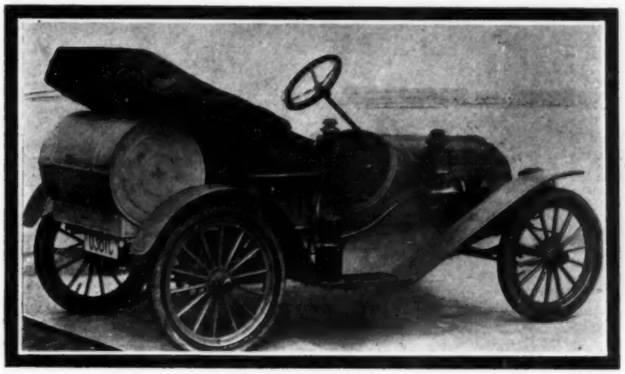


Fig. 5—Metz small parcels delivery car

Fig. 6—Hewitt 10-ton coal truck

are performed. The only difficulty is that he will be a merchant in a small way, due to the fact that his volume of business cannot exceed the amount that he will be able to attend to in person. Most merchants are far from satisfied with a business of this magnitude, and in the desire to extend it is necessary for them to engage other men to do some of the work—hence the personal equation.

That the personal equation is the same regardless of the number of men employed is far from true. How does the personal equation grow with the number of men engaged? This is a question that most merchants would like to have answered for them. But does it not seem true that the extent of troubles with men who are assigned to the various tasks depends upon the kind of talent that is employed? Assuming that the talent is appropriate, is it not a fair inference that the amount of inefficiency will depend upon the system that is used in the conduct of the affairs of the merchant?

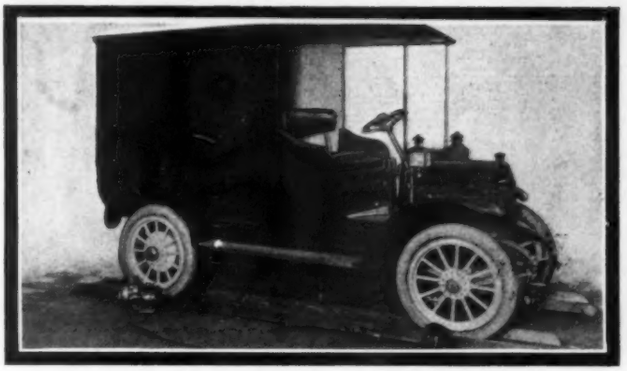


Fig. 7—Atlas box delivery wagon

Fig. 8—Alco three-ton open delivery truck

In the delivery of goods, for illustration, if the work to be done requires the services of 100 drivers, there will be all the troubles that come in the handling of each of the men as individuals, but why overlook the fact that there will be added to this volume of trouble the accumulation of difficulties that represent the wilfulness of a body of 100 men? With only one man it is scarcely to be supposed that much of a system would be required; considering 10 men surely a system would have to be set into motion, but with 100 men, the system that would hold together an organization consisting of 10 men would crumble into dust within a few days and the men would play ducks and drakes with the business of the merchant.

What is the right plan to adopt from this point of view? Build up a system that will hold a large body of men in subjection? What is the fault in a system that will reduce the number of the men to, say, 50 instead of 100?

The virtue of the system that requires the least number of men, if it is recounted by the man of shallow proclivities, lies in the reduced size of the pay-roll. Strange to relate, this is the least thing to consider despite the fact that it is too much of a good thing to be lightly thrust aside.

One of the largest of the "department stores" in New York City, in trying to take advantage of the automobile as a means of delivering merchandise, hit upon the happy (?) expedient of saving the horses by applying them to short-haul work. The automobiles were sent on the long hauls to Harlem and the Bronx. What was the result? There were times, during the working of this system, when the horse-drawn vehicles were over-worked, and the automobiles were reduced to the level of traveling 10 miles with half a load, thus making them unprofitable, and they were so reported. It soon leaked out that the horses were being over-worked although they were being trotted around in a circle. The management failed to appreciate the fact that the distance traveled in a day was quite as far when the horses were doing work within a restricted zone as would

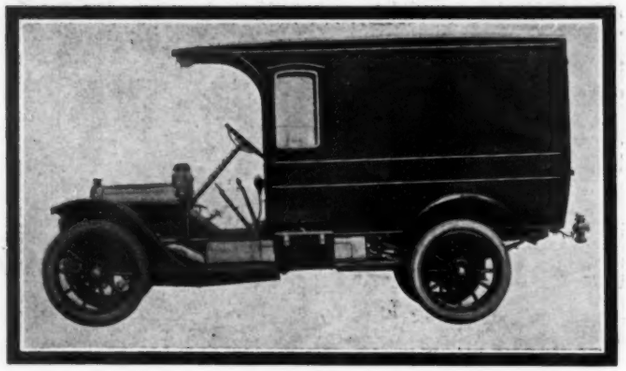


Fig. 9—White box 1500-pound truck

have been true had they been required to go to Harlem and back within the day's work.

It will not be the purpose here to claim that the automobiles should be placed on the short-haul, putting the horses to the long-haul work. The point is that the automobiles should be taken advantage of on an automobile basis; not on a horse basis!

How is this to be accomplished? Is it not a case of organizing; of using the horses for what they are worth; of making the automobiles do "trunk-line" work; limiting horses to their relatively restricted ability, in the local delivery of goods? System is what is most in need, but the system, no matter how it is contrived, should allow of the use of the automobiles, giving to them the widest scope. They ought to be so placed that they will pay interest on the larger investment. The investment should be larger, due to the greater ability of the automobiles; the fault lies, if such there is, in not taking account of the superior radius of travel of the automobiles over the possible radius of travel of the horses.

But in figuring upon automobiles, why demand excessive speed? It is too well known to be denied that horse-drawn trucks, for illustration, make about 11 miles per day in New York City. Why ask an automobile maker to risk undue depreciation of his product by requiring that the speed of the automobile be 20 miles per hour? Must an automobile make a greater mileage within one hour than a horse can average in a day, in order to attract the notice of a merchant?

The argument that an automobile should be so designed that it will travel fast coming home is as full of possibilities for trouble as a can of dynamite is full of surprise packages.

It is a good argument for the salesman to put up to the merchant who is so unsophisticated that he would not know anything about business at all, but it is not the method of persuasion of the maker of automobiles of the class who desires to have his customers become his advertisement of the future, nor is the merchant who accepts this doctrine the one who wears "service stripes" upon his sleeve.

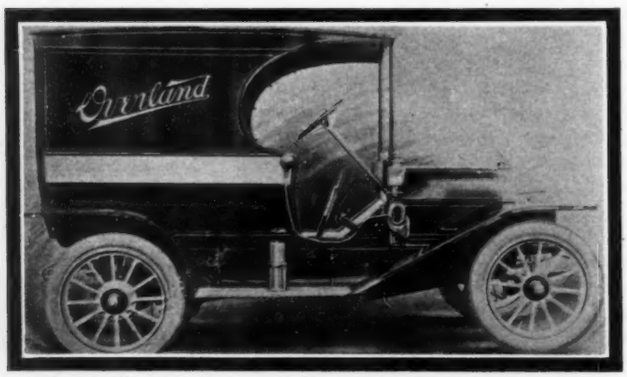


Fig. 10—Overland C15 delivery wagon

When it is considered that a racing automobile, made, as it is, of the finest grades of steel, designed especially for racing by men of accentuated skill, will scarcely last for a single day in a great race, how is it to be expected that a freight automobile is going to thrive and its owner prosper if the automobile is entered for a race for home every day in the week?

Is it not strange that drivers of freight automobiles should be arrested for violating the speed laws? Is there anyone who thinks that such arrests have not been made? Will they examine the "police blotter" of New York City and ascertain the bottom facts on this point? Certainly, the speed laws were never intended to control freight automobiles; the reason for this is that no framer of speed laws ever supposed that anyone would be so lacking in good sense as to permit of such a performance!

But this is where the personal equation crops out again, that is, if the automobiles are so made that they will respond to the eagerness of the driver, who, desiring to get home, notches the

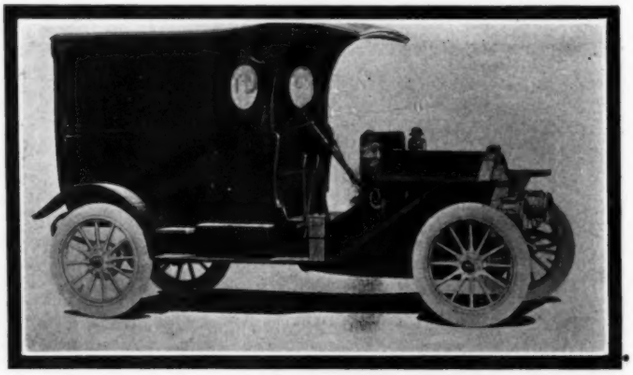


Fig. 11—Stoddard "30" commercial delivery car

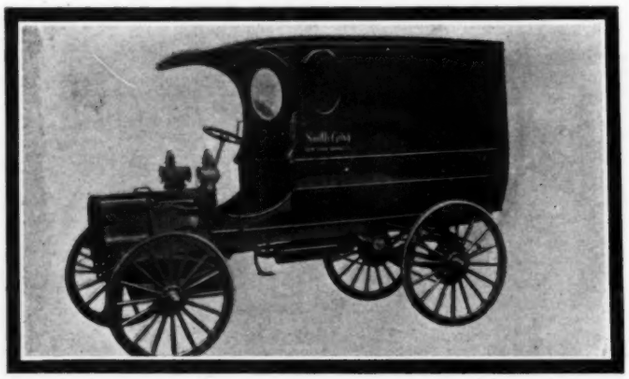


Fig. 12—Chase parcels delivery wagon

control lever out to the limit. There is no known way to prevent a driver from feeling that home is a good place to go at the end of the day. There is no possible chance of the merchant being able to personally regulate the conduct of the 100 drivers that he may have under his flag, but not within the restraining influence of his personal prudence.

What is the proper course to map out? Pay the piper! Would it not be more to the point to quit demanding high speed; to learn that the ability of the automobile is not dependent upon this excessive speed; to have sense about it, and allow prudence and all of the other qualities that the same merchant uses in the progress of the remaining part of his business to retain the mastery. Certainly, if the merchant allows speed to creep into his bones in conjunction with the running of his freight automobiles to the extent that he does the speed of his personal pleasure automobile when he goes in quest of fresh air and recreation, the experience that he will have to pay for will come up to his most sanguine expectation.

Some of the Department Stores Worked Out Their Salvation and All That Remains Is for Others to Reap the Reward

Experience is the great teacher, but it is a great misfortune that most men are so constituted that they cannot accept experience unless they pay the bill. It is like free advice; what a small number of men there are in the world who are willing to act on free advice!—perhaps 1 in 10,000.

Relating experience is a difficult thing to do on account of the scarcity of those who are willing to tabulate it. As a rule, the men who have experience are so busy acting upon its dictates that they have no time left to the relating of it. Again, experience is a stock in trade; it is one of the assets of a merchant; were he to sell out he would have listed in his assets, among other things, as good will, experience, or, better yet, *the product of experience!*

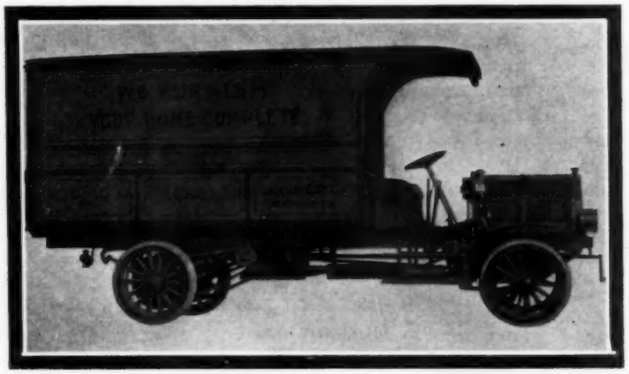


Fig. 13—Atterbury N40 closed delivery wagon

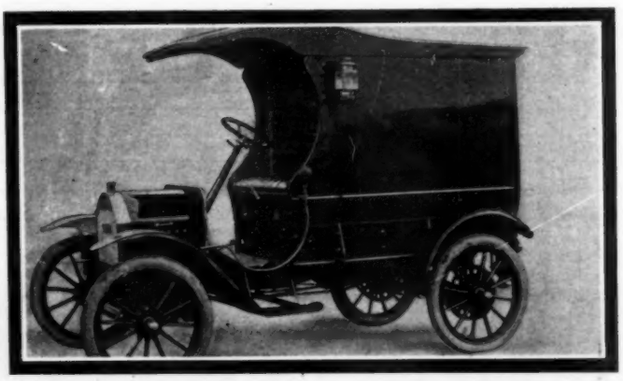


Fig. 14—Brush delivery car

Desiring to better the situation to whatever extent the state of the art permits, THE AUTOMOBILE sent out a form, with questions, to be answered as here reproduced. It cannot be said that the result was very pleasing. Nearly every merchant who was requisitioned to answer these questions pleaded poverty; they said that they had not kept an account of the delivery department's activities. Evidently they were disinclined to know the size of their greatest leak. Some of these merchants have pronounced ideas as to the proper way to deliver goods, but it is strange that they should know very much about it, basing this assumption upon their failure to answer any of the questions on the admission that they have not kept track of the doings of the delivery department.

At all events the questions, as they were asked, are here presented, and such of the answers as may have been submitted are printed also. It is noteworthy that one of the most successful department stores in the world, R. H. Macy & Company, of New York City, had a full line of data relating to the delivery department. Mr. Percy S. Strauss, whose indefatigable management is well appreciated by those who keep track of such matters, aided by Mr. Thomas Brennan of the mechanical department of the concern, placed at the disposal of THE AUTOMOBILE every facility for the purpose in hand, and if the situation warrants it is proposed at some early date to print details of the methods in vogue for the delivery of the vast amount of goods that R. H. Macy & Co. handles in a day. The form follows:

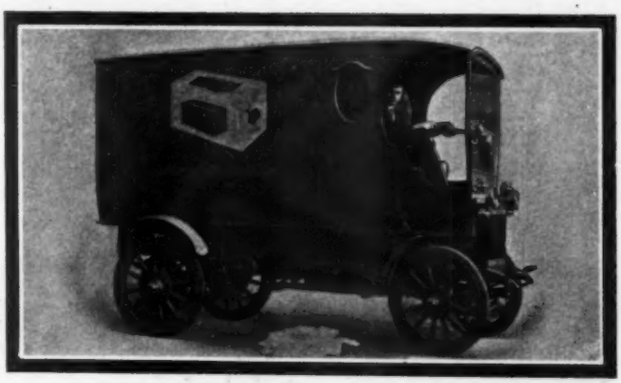


Fig. 15—Randolph enclosed delivery wagon

Gentlemen—It is the purpose of THE AUTOMOBILE to devote space to the question of the delivery of goods, and recognizing the position you hold in this field it is desired that you answer some of the questions as follows:

(A) Do you use automobile delivery wagons at all; if so, to what extent?

(B) Do you employ horse-drawn delivery wagons; if so, to what extent?

(C) What is the method you employ in working automobiles and horse-drawn vehicles to get the best results out of each class of vehicle?

(D) What is your experience with automobiles?

(E) What is your best opinion as to the future use of automobiles?

(F) How long will it be, in your opinion, before automobiles will entirely supersede horses?

(G) If you think that horses will always be used, will you state why?

(H) Do you keep track of the cost of making deliveries of goods by horse-drawn vehicles?

(I) What is the cost?

(J) Do you keep track of the cost of delivering goods by means of automobiles?

(K) What is the cost?

(L) If automobiles are limited to long-haul work by you, will you state why?

(M) Is it due to the fact that your horse-drawn vehicles are not suited to long-haul work?

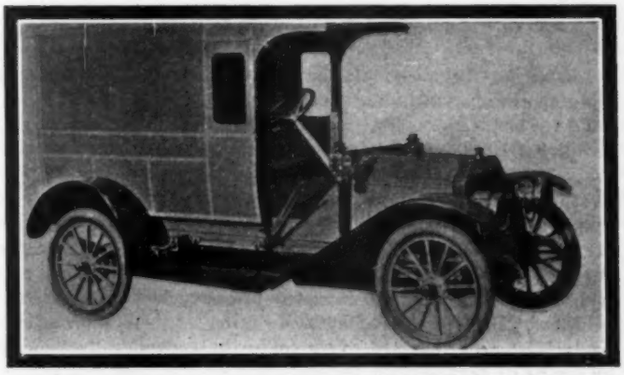


Fig. 16—Warren-Detroit box delivery wagon

(N) Why should automobiles not be suitable for short-haul work?

(O) What is the speed at which you run your automobiles?

(P) What kind of automobiles do you run?

(Q) How many trips per day do you get out of your automobiles?

(R) What is the average mileage per trip and per day?

(S) What is the number of trips that you realize per day with horses?

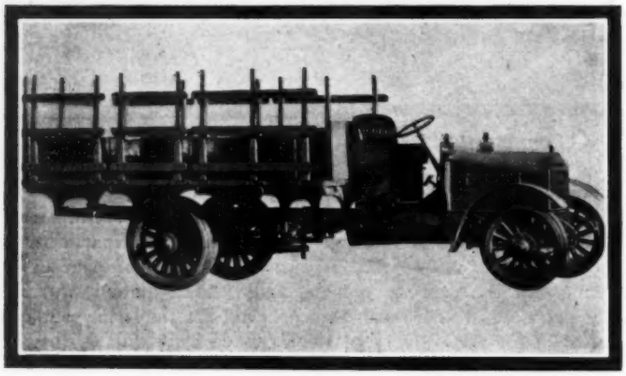


Fig. 17—Pierce-Arrow stake truck

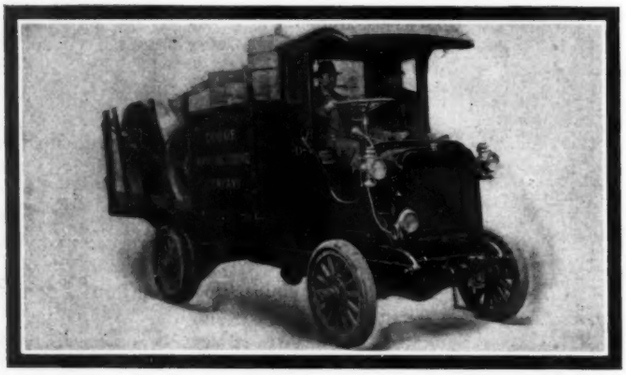


Fig. 18—Rapid 40-hp. stake truck

(T) What is the average mileage per trip and per day?

(U) How do you keep track of the service that you realize from automobiles?

(V) Will you include the form of report in your answer?

(W) How do you keep track of the service that you realize from horses?

(X) Will you include a copy of a report with your answer?

(Y) What is the rate of depreciation of horse-drawn vehicles?

(Z) What other questions do you consider are important?

Answering the questions, the following would seem to be a close approximation of the existing facts:

(A) The delivery system includes 32 electric vehicles and 4 gasoline freight automobiles. Two of the gasoline automobiles are of 3 1-2 tons rating and are used for transfer work, delivering goods from the store to railway stations in response to out-of-town demand. The remaining two gasoline automobiles are of 1-ton rating, and are pressed into the service of making the long-distance hauls to Coney Island, Seagate and other outlying districts that are too far away to be reached by the electric vehicles. The electric vehicles are used for the intermediate hauls; distances that are too great to be economically handled by means of horse-drawn vehicles.

The short haul-work is taken care of by means of horse-drawn vehicles, comprising 100 spans of horses and vehicles of the light delivery wagon sort for the most part.

(D) Electric vehicles make from 30 to 40 miles per day. Gasoline trucks travel about 60 miles per day. Horse-drawn vehicles average 11 miles per day.

(H) A system is used to direct the work, and records are kept. The blank forms employed are here shown.

(L) Have not seen fit to use gasoline automobiles in short-haul work.

(M) Owing to the lack of ability of horse-drawn vehicles under conditions of long hauls a system as follows has been put into force:

Deliveries are made by means of gasoline automobiles to certain centers as Woodlawn, Portchester, Newark, Hackensack, Coney Island, Seagate and such other centers around New York City as are shown in the accompanying map (page 674). Horse-drawn vehicles, which are stabled at these centers, are pressed into service in the local delivery work.

(O) Gasoline automobiles, as used, have a speed of about 15 miles per hour. Electric vehicles, as used, are designed to run at about 10 to 12 miles per hour. Horse-drawn vehicles make about 3 1-2 miles per hour.

(P) Electric vehicles are fitted with both lead-lead and nickel-iron batteries—four makes of electric vehicles are in service here.

(Q) Long hauls, using gasoline automobiles, generally one trip per day; two trips on Saturday and during special occasions.

R. H. MACY & CO. Auto Station

INSPECTOR'S REPORT Date

Vehicle	CONDITION
201	
202	
203	
204	
205	
206	
207	
208	
209	

Log of daily performance of the automobiles—each car is known by number which is never changed

Fig. 19—Mack 5-ton truck

Intermediate hauls, using electric vehicles, two trips per day, and on special occasions three trips per day. Horse-drawn vehicles for the local deliveries up to the limit of ability.

(R) Gasoline automobiles make 60 miles per day. Electric vehicles make 30 to 40 miles per day, and horse-drawn vehicles average 11 miles per day.

(S) There seems to be no way of making a comparison of

the value of the service rendered by the respective makes of vehicles.

(W) A system of "logs" is employed in the accounting department, by means of which each vehicle, by number, is reached from day to day. Mileage, trips, incidents, etc., are noted. A record of all costs is kept. Extraordinary expenses, as results of accidents, are kept separately.

Record of the Cost of Operating Delivery Wagons and Trucks

According to the records of R. H. Macy & Company, the costs of operating the several types of freight automobiles from February 1, 1910, to February 1, 1911, was as follows:

ELECTRIC DELIVERY WAGONS EQUIPPED WITH LEAD BATTERIES.

Cost of maintenance for 14 vehicles	$12,445.29
Mileage covered	112,089
Per mile	11.13

ELECTRIC DELIVERY WAGONS EQUIPPED WITH NICKEL-IRON BATTERIES.

Cost of maintenance for 18 vehicles	$15,463.78
Mileage covered	162,856
Per mile	9.49

SUMMARY OF COSTS OF DELIVERY BY MEANS OF ELECTRIC VEHICLES.

Cost of maintenance for 32 electric vehicles	$27,909.07
Total mileage made	274,945
Per mile	10.15

R. H. Macy & Co., Auto Station
DRIVERS' DAILY REPORT

Date

VEHICLE	MILES 1st TRIP	MILES 2d TRIP	MILES 3d TRIP	TOTAL MILEAGE	CONDITION OF VEHICLE AND REPAIRS	TIME OUT	TIME IN	CHAUFFEUR
201								
202								
203								
204								
205								
206								
207								
208								
209								
210								

Detailed record of daily performance of the automobiles—this record goes into permanent form for future reference

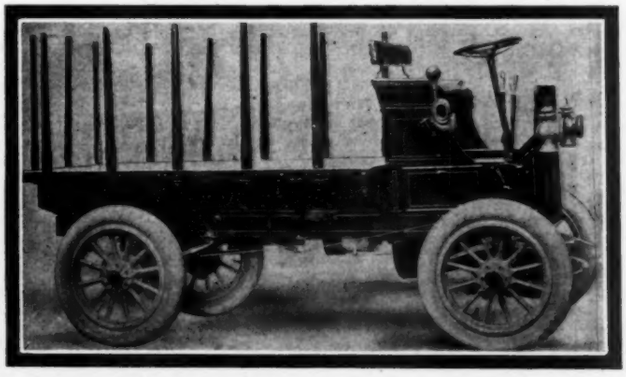


Fig. 20—Franklin stake truck with pneumatic tires

RECORD OF PERFORMANCE OF A 31-2 TON GASOLINE TRUCK.

Cost of maintenance	$2,486.97
Mileage covered from April 10, 1910 to January 1, 1911	14,220
Per ton mile	4.99

The figures, as here given, were taken from the records of the cost of delivering of goods by the several mechanical systems, but it remains to be said that the gasoline automobile figures are under the shadow of very few of this class of equipment in conjunction with a considerable number of electric vehicles. But this is a way of bringing out the fact that there is not the same need for gasoline automobiles.

How to Clean Aluminum.—There are several parts of the automobile that are made of aluminum, such as floor boards, steps and steering wheel centers, which are liable to become dis-

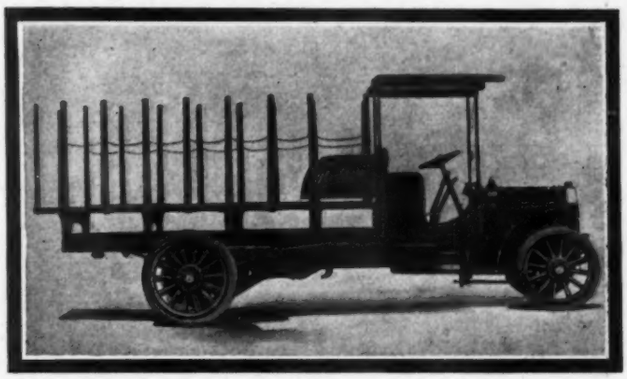


Fig. 21—Peerless 5-ton stake truck

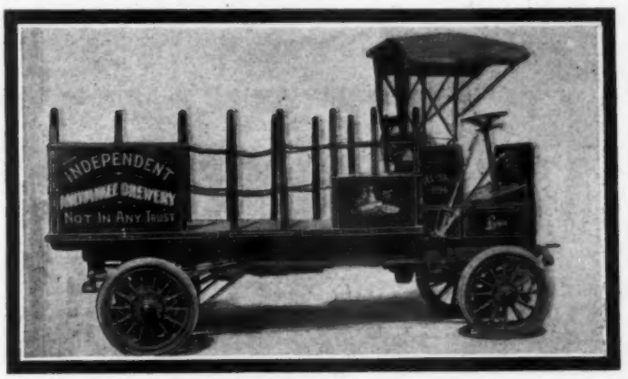
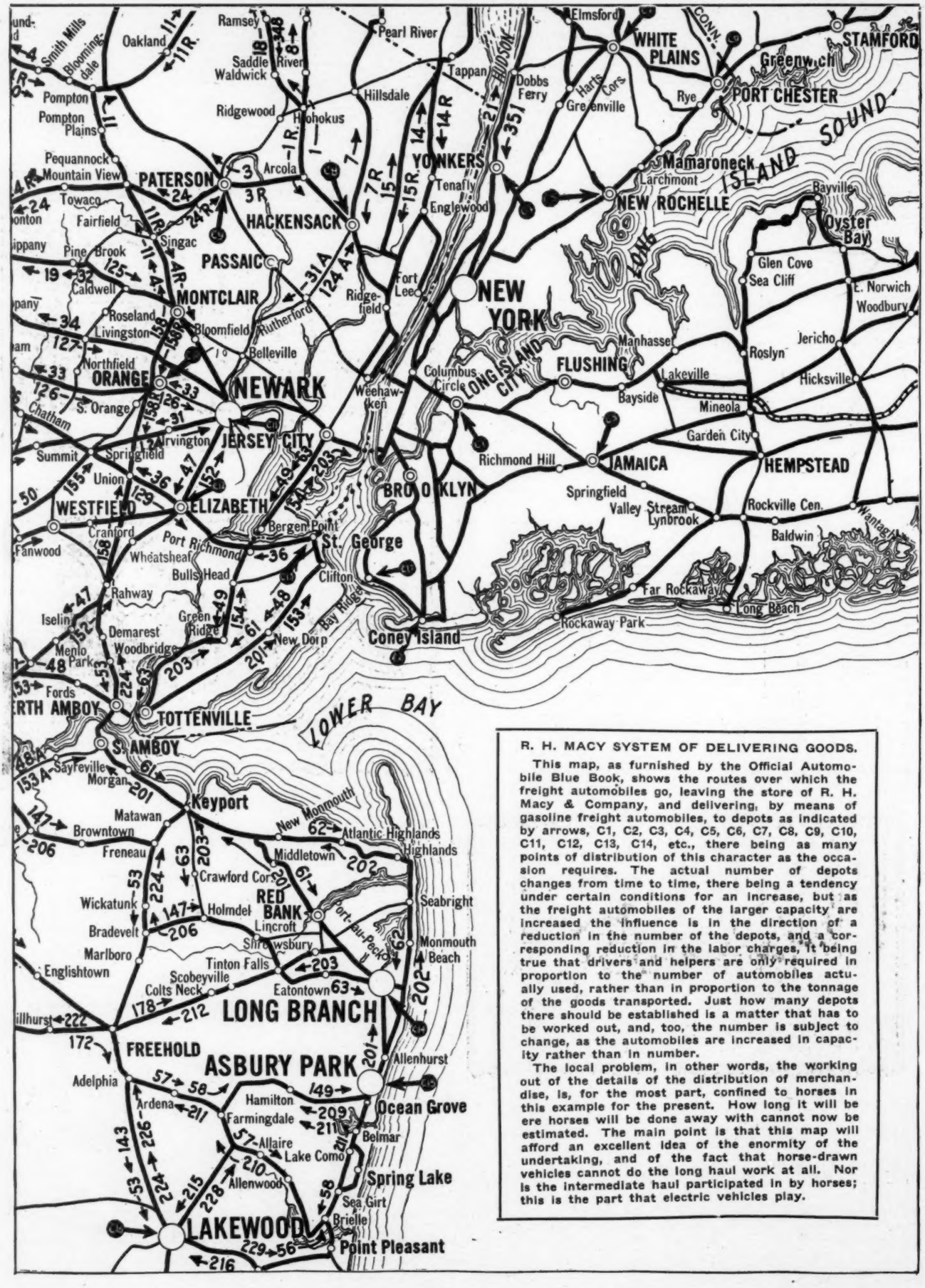


Fig. 22—Champion brewery stake truck

colored. Difficulty is often encountered in cleaning same. If one part of sulphuric acid is mixed with six to eight parts of water it is possible to remove the stains by rubbing this mixture over the metal, but care should be taken to remove the acid by carefully washing it off with plain water afterward. Another method is to mix some very fine emery powder with some essence of turpentine so as to form a paste.—*La Pratique.*

Varnish the Protector and Beautifier.—No more delicate or sensitive medium is employed in connection with the completion of the automobile than the varnish—the protector and beautifier of all the materials entering into what may be termed the paint structure. That this material should be of rare quality, of a worth beyond the mere measure of dollars and cents, goes without saying. Hence it is not a question of price, but one of quality that must be taken into account in making a final estimate of the elements entering into and making up the finished product, to-day accepted as an example of the painter's art.

Don't overlook the peril of your position when you enter into relation with the fellow who has all of the technical knowledge on his side—come prepared for any eventuality.



R. H. MACY SYSTEM OF DELIVERING GOODS.

This map, as furnished by the Official Automobile Blue Book, shows the routes over which the freight automobiles go, leaving the store of R. H. Macy & Company, and delivering, by means of gasoline freight automobiles, to depots as indicated by arrows, C1, C2, C3, C4, C5, C6, C7, C8, C9, C10, C11, C12, C13, C14, etc., there being as many points of distribution of this character as the occasion requires. The actual number of depots changes from time to time, there being a tendency under certain conditions for an increase, but as the freight automobiles of the larger capacity are increased the influence is in the direction of a reduction in the number of the depots, and a corresponding reduction in the labor charges, it being true that drivers and helpers are only required in proportion to the number of automobiles actually used, rather than in proportion to the tonnage of the goods transported. Just how many depots there should be established is a matter that has to be worked out, and, too, the number is subject to change, as the automobiles are increased in capacity rather than in number.

The local problem, in other words, the working out of the details of the distribution of merchandise, is, for the most part, confined to horses in this example for the present. How long it will be ere horses will be done away with cannot now be estimated. The main point is that this map will afford an excellent idea of the enormity of the undertaking, and of the fact that horse-drawn vehicles cannot do the long haul work at all. Nor is the intermediate haul participated in by horses; this is the part that electric vehicles play.

Testing Automobiles

Description of the Plant in Use at the Worcester (Mass.) Polytechnic Institute

As a part of the work in gas engineering at the Worcester Polytechnic Institute, Worcester, Mass., there is in use an elaborate apparatus for the complete testing of automobile engines, both direct and through the rear wheels. For testing engines "on the block," the Alden Absorption Dynamometer is utilized. Any torque from zero to more than enough to stall an engine at any speed is available instantly by the simple turning of a water valve. The apparatus for determining the rear wheel horsepower is so fitted that an automobile may be run in, connected up, tested and run out in a very short time, and at no inconvenience to the owner. It consists of two heavy pulleys arranged with their surfaces level with the top of the floor and keyed to a large shaft running in frictionless roller bearings of the Sellers type. On one end of this shaft is placed a dynamometer. This has an arm which operates a heavy pendulum away from the vertical or zero position as the draw bar pull increases. The position of the pendulum is transferred by an ingenious electrical mechanism to a large board shown in Fig. 1 and indicates the pull exerted by the automobile in pounds directly. By means of another device the speed in miles per hour is at the same time indicated on the chart. By noting the intersection of these two movable lines and comparing with the fixed curves on the chart the actual horsepower delivered by the rear wheels is determined. In testing for horsepower, the following scheme is carried out: The driver operates with full throttle throughout the test and governs the ignition according to the speed of the engine; load is then applied (by the dynamometer) enough to keep the indicated speed down to say 10 miles per hour and the horsepower is noted. The speed is then allowed to increase to 15 miles per hour and the horsepower again noted. This is done for various speeds up to and beyond the maximum horsepower of the car and the data plotted in the form of a curve, a sample of which is shown in Fig. 2.

Fig. 3 shows a graphic record of the performance of a car during test and is made automatically by the car itself. By it is shown the draw bar pull, speed and horsepower of the car under the existing conditions of operation.

The important results of such tests are that they give a valuable comparison for the various manufacturers, especially with reference to what might be called "rear wheel efficiency" or total weight of car for delivered horsepower, loss between engine and ground, action of carbureter on slow speeds (engine pulling at capacity), accleration factor, evenness of operation under load, testing for trouble under working conditions, etc.

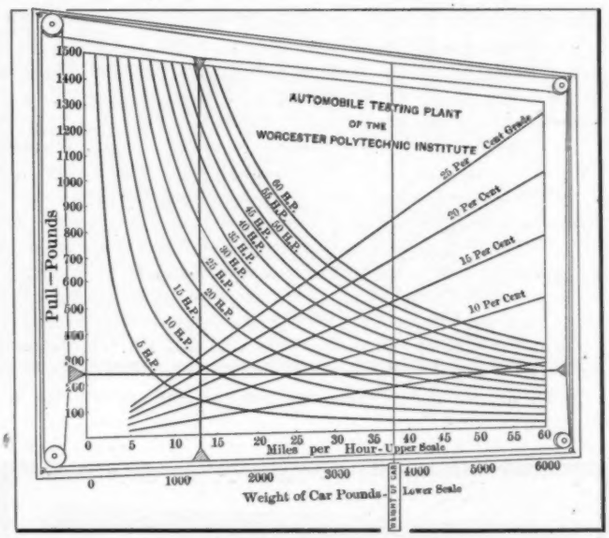


Fig. 1—Chart from which horsepower is read directly during test (8.3 hp. is the reading indicated in figure)

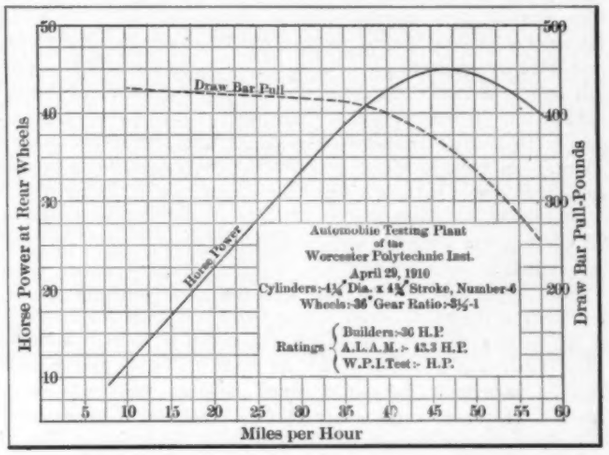


Fig. 2—Fac-simile of "certificate of performance" of a test which indicated higher power than that claimed by the makers

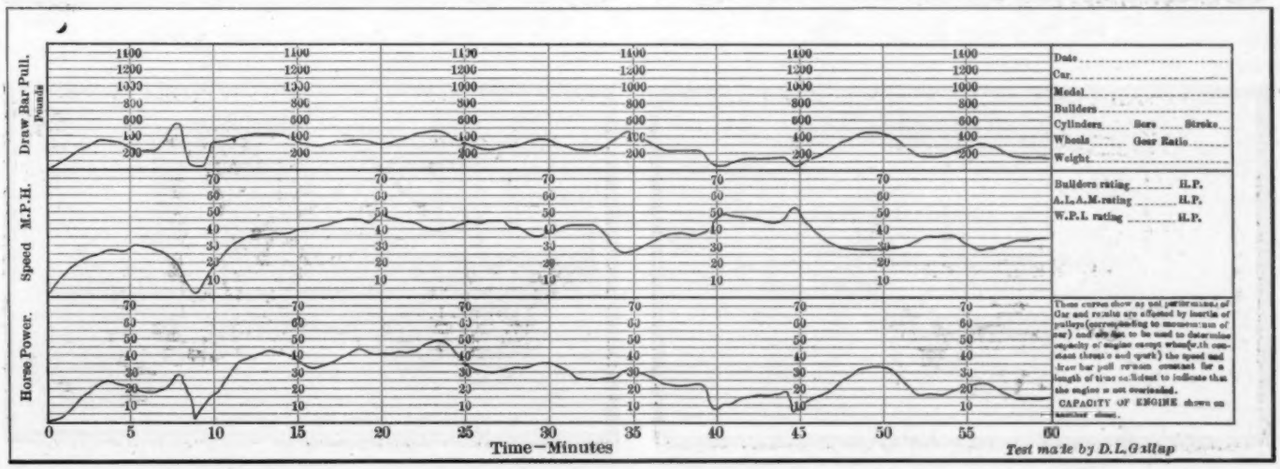


Fig. 3—Fac-simile of "curve of performance" of a car during a test, and made automatically by the car itself

Newmotor Had an Interesting Time It Was Easy

Enough to Decide Upon the Automobile, But It Was Difficult to Determine What to Select for It

NEWMOTOR was a prosperous general contractor with a considerable business that was spread out over a large area; he took contracts for decorating and finishing residence properties over an area of 40 square miles. Quite a number of these contracts were too small to handle profitably in the way that Newmotor was doing it, and a friend of his, one who had some experience in the delivery of merchandise, told him that what he needed was an automobile delivery wagon. Newmotor was the happy father of a large family, and, being a man of some refinement, it occurred to him that he could easily kill two birds with one stone; get an automobile that would be satisfactory for business on Monday and serve to bring his family to church on Sunday, with perhaps a run out into the country on Sunday afternoon, and then there were the holidays to pass in a way that would bring pleasure and profit besides.

In talking over his plans with Mrs. Newmotor she said: "It strikes me that what you need is a delivery wagon, not a pleasure automobile!"

"Certainly," said Newmotor, "I do want a business proposition, but what is the matter with killing two birds with one stone?"

"Supposing that you miss both birds," said Mrs. Newmotor. "My father was a sensible man; he made a success of everything that he undertook; he never mixed business with pleasure, but there were times when father made a business of pleasure and on such occasions nothing would induce him to depart from his rule of having nothing around him that would suggest business. I believe that father was a man whom it might pay anyone to emulate."

"Yes, I remember; the 'old gentleman' certainly did go after things with a pitchfork; even when he played, it was almost work! I was much disposed to pattern after him, but I get out of breath when I try as hard as he did."

"Moderation might have been a little better for father," said Mrs. Newmotor, "but I contend that he had the right idea, although I am ready to admit that it is not necessary to make business out of pleasure."

"If I gather the right impression from what you are saying, it will not be a proper plan for me to consider the pleasure side of the question when I go after a business wagon."

"I was talking to Mrs. Groceryman a few days ago," said Mrs. Newmotor, "and she said that Mr. Groceryman tried out the idea of having a delivery wagon that could be used on Sunday, but that the plan did not work out as he had expected. She claims that the automobile was too speedy for delivery work, and too slow for pleasure purposes. The end was that the depreciation was too high!"

"What did she mean when she said that the car was too fast for delivery work?"

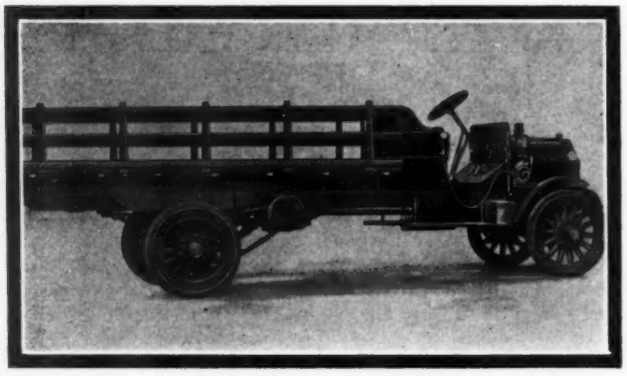


Fig. 23—Stearns 22 3-ton truck

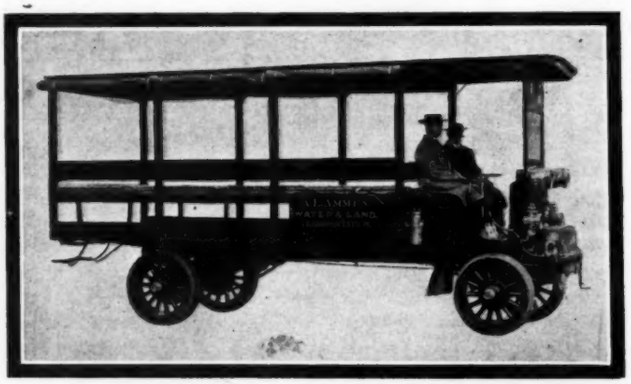


Fig. 25—Grabowsky power wagon

Fig. 24—Autocar cage delivery wagon

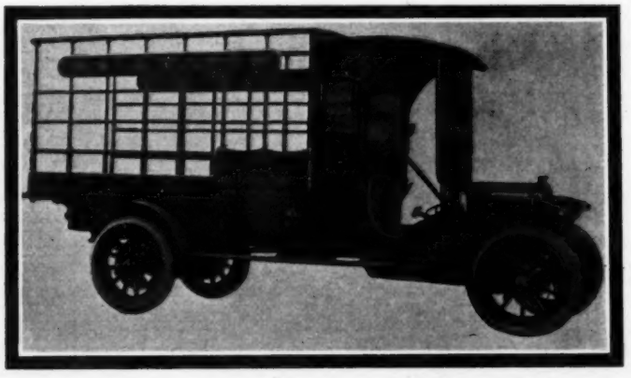


Fig. 26—White three-ton open truck

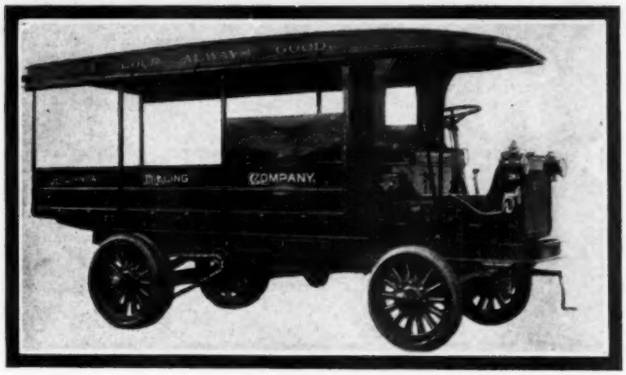


Fig. 27—Gramm truck with convertible body

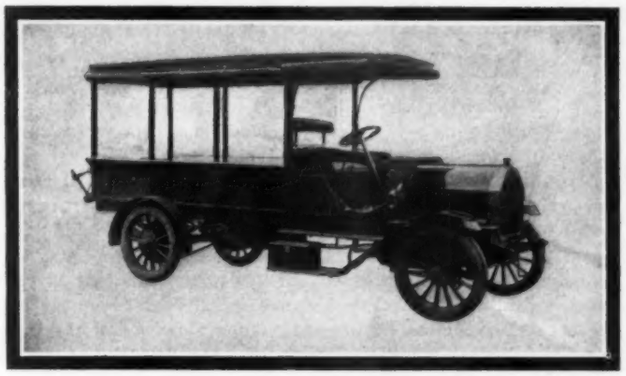


Fig. 29—Victor truck with top

Fig. 28—Brodesser stake truck

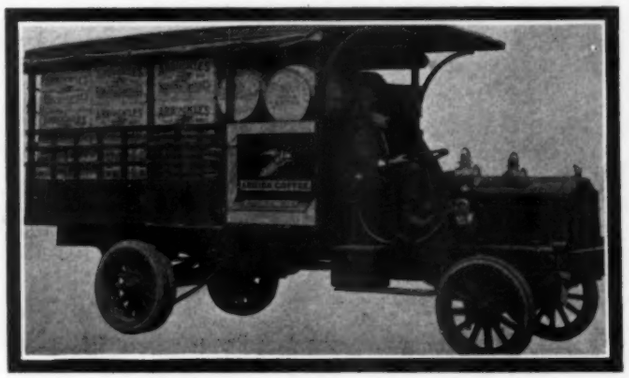


Fig. 30—Packard 5-ton truck with top and curtains

"Well! according to Mrs. Groceryman, when the automobile was used during week days the young man who drove it raced it around the streets, and the result was that it was in the repair shop half of the time and the repair bills were excessive."

"But," said Mr. Newmotor, "I would not allow my man to drive the automobile fast at all!"

"Would it pay you to sit alongside of him every day he goes out for the purpose of preventing him from racing?"

"I would not sit alongside of him! I would tell him to go slow!"

"What is your experience with him? Does he obey you implicitly as it is?"

"Well, I cannot claim that he is a paragon of virtue when it comes to obedience."

"As a matter of fact," said Mrs. Newmotor, "he would not know a paragon if it was sitting in his lap!"

"But, I could get another man," said Mr. Newmotor. "I would be careful and find a man of some experience, one who is used to the running of freight automobiles."

"Is this not another way for running up the cost of the service? In other words, if you pay a man $5 per week more than you ordinarily would, this extra cost would amount to $260 per year, and, come to think of it, this is 6 per cent. upon $4,316 in round numbers. Would it not be better to invest $1,000 in a passenger automobile for Sunday and holiday use if you want one; you would then have $3,316 of capital drawing interest, or working for you, that would not be tied up in automobile work!"

"What a head you have for business," said Mr. Newmotor. "I had no idea that you were so well grounded. What you say is right. It would not be right to place a 'road locomotive' in the hands of a man such as I now have, and were I to engage a man of more discretion, I would have to pay the extra cost, thus defeating the very project that I am most interested in."

"More than that," said Mrs. Newmotor, "even a good man cannot prevent an automobile from depreciating if it is designed for high speed and it is required to run at low speed. I was over at Mrs. Truckman's house yesterday, and Mr. Truckman came in while I was there; he was telling her that it was a mistake to use high-speed freight automobiles, because they cannot go slow advantageously, due to the fact that the gear ratio is not suited for the lower speed, and the result is that they are either made to go fast or it becomes necessary to run the motor slow, unless the driver slides into a lower gear. Mr. Truckman claims that it is too much to expect that the driver will do much sliding of gears, and the result is that the motor is required to go slow."

"I do not understand why anyone should object to the motor going slow!"

"The reason that Mr. Truckman gave," said Mrs. Newmotor, "seems to be a good one. It was his idea that when the motor is heavily loaded and it runs at a low speed, the crankshaft, and, in fine, all of the rotative members, are twisted in the inverse ratio of the speed; as he put it, the torque of the motor is greater at the low speed, and since torque is but an expression of twisting moment, so-called, it stands to reason that the whole phenomenon may be shown by the algebraic expression, as follows:

$$P = \frac{H.P. \times 33{,}000}{2\pi R S}$$

When

P = pull in pounds at unit radius.

H.P. = the horsepower of the motor at the given speed.

$2\pi = 6.28$

R = radius in feet.

S = speed in revolutions per minute.

"The way to find out just what this means is to take an example, applying the formula in a concrete case thus:

When

H.P. = 30 at 1,600 revolutions per minute.

H.P. = 20 at 800 revolutions per minute.

It follows that

$$P = \frac{30 \times 33{,}000}{6.28 \times 1 \times 1{,}600} = 98.5 \text{ pounds at 1 foot radius,}$$

and

$$P = \frac{20 \times 33{,}000}{6.28 \times 1 \times 800} = 131 \text{ pounds at 1 foot radius.}$$

"I do not know that I have taken a good example, but this is the principle of the thing as it was presented by Mr. Truckman, and I am sure that it is an idea that is well worth taking into account when you go after a freight automobile."

"I am a little dull on figures, but if I gather the drift of your presentation, what Mr. Truckman intended to convey was that the crankshaft and all of the functioning members of the tru are twisted more when the motor is going slow than they are when the motor is running at its normal or best speed! It seems

Fig. 31—Oliver wagon with screen body

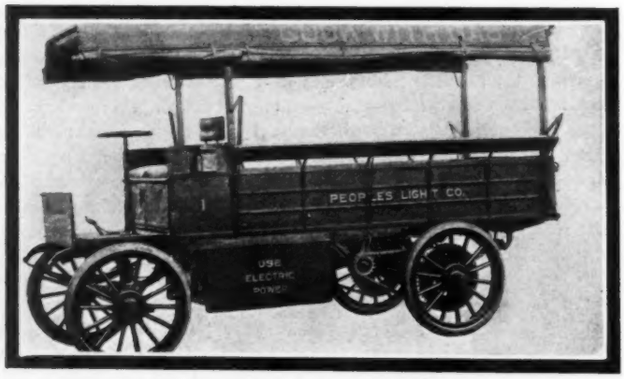


Fig. 32—General vehicle 2000-pound wagon

to me, though, that speed, that is to say, very high speed, should be a serious factor to contend with!"

"Yes! Mr. Truckman explained that more damage may be done at a high speed, referring to an abnormal rate of travel, than will be induced if the revolutions are kept down. The way he put it was that the 'secondary moments' increase as the square of the speed; this extra duty would come on the motor whether it is doing useful work or not; according to this way of reckoning, it would not make any difference at all about the build of the truck; the motor would be damaged if it were allowed to speed up—the method of overcoming this trouble is to so design the motor that it will not speed up to a point where the secondary moments will endanger the crankshaft and other parts."

"I do not understand how this can be accomplished! If the motor is running under a full load, and this resistance is suddenly relieved, how did Truckman say that the motor may be prevented from speeding up?"

"He said that it is a question of designing of the motor. If the motor is so designed that the gas cannot travel to the receding

Fig. 33—Reo power wagon delivering goods in the snow

piston over a certain rate, the speed of the crankshaft will be checked ere damage may be done. Evidently, it was his idea that the valves should be small as compared with the valve system in a racing motor, for illustration!"

"I begin to see daylight. There is a difference, a marked difference, let us say, between a motor that is designed for freight automobile service, and the character of motor that would be best suited to passenger automobile service, and, if this is so, it must be true of racing motors, that they will differ in material particulars from motors that are best suited to passenger automobile work—do you not think so?"

"Yes! moreover, according to Mr. Truckman, it is not a good idea to invest in freight automobiles that are mere passenger automobiles equipped with a platform, or other freight automobile body; he says that the structure is too light!"

"Dear me! What a lot of things there are to take into account when one desires to purchase a freight automobile! When I desire to invest in a horse-drawn vehicle, all that I have to do is go down to the maker and get one!"

"Did it ever occur to you that horse-drawn vehicles are as old as the hills, and that freight automobiles are still in the constructive period of their existence?"

"No! I failed to take that into account! But I should! There must have been a time when it was quite a risk to invest money in a horse-drawn vehicle! But how about the extra weight; will it not have a deteriorating influence upon the rubber tire equipment?"

"On the contrary! According to Mr. Truckman, if the automobile is heavier, provided it is designed to travel slow, the depreciation will be lower than when a lighter weight automobile is driven at a relatively high speed. According to Mr. Truckman, the life of an automobile is inversely proportional to the square of the velocity and to the weight, assuming that it is not overloaded. What he intended to say may be more clearly explained as follows: If an automobile is made to travel at, say, 10 miles

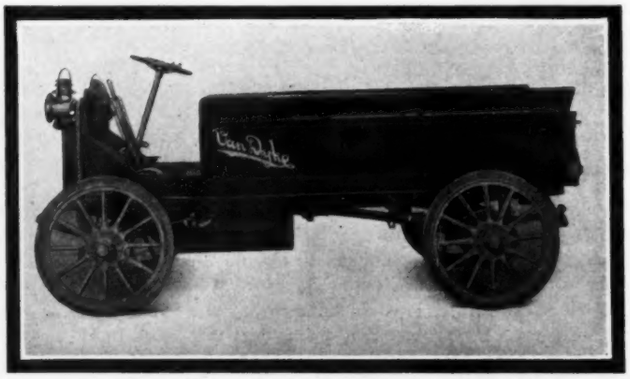


Fig. 34—Van Dyke wagon without top

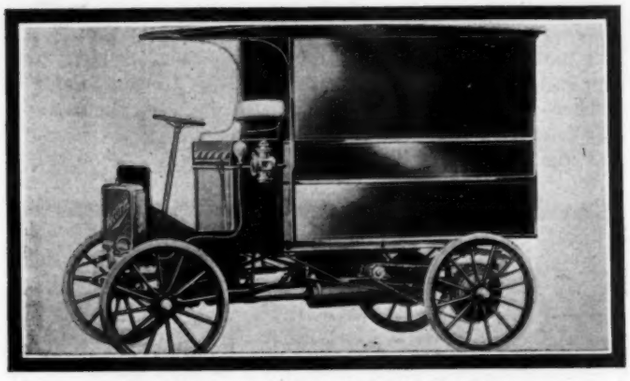


Fig. 35—Acorn box delivery wagon

per hour, it will have a certain life, but if this automobile is then made to go at a rate of speed of 20 miles per hour, the life of the same will be decreased to one-quarter of the life expectation at 10 miles per hour. This is a serious matter; the entire feasibility of the project is tied up in the proper regulation of the speed of the automobile."

"But you have not explained about the tire life; where do they come in in the statement that you have just made?"

"You should understand that when the automobile is required to go at double a given speed, it also happens that the peripherial velocity of the rims of the wheels, hence the tires, is increased at the same rate, and, taking notice of the speed of the automobile on the road, it is just the same as accounting for the peripheral velocity of the tires and the crankshaft speed in revolutions per minute."

"From what you have said, I gather that the 'square law' holds for every part of the automobile, and that it is just as proper to note the speed of the car on the road as it is to figure upon the crankshaft speed or the velocity in fine of any of the rotative members."

"You have the right idea, leastwise, that is how I understand it after listening to Mr. Truckman."

"You must have been listening!"

Newmotor Goes in Quest of an Automobile with Well-Defined Ideas of What He Needs

It was a fine day in March when Newmotor left home with the idea imbeded in his grey matter that he would invest in a freight automobile of the kind that would be the best investment for him. He figured out that his requirement was such that a delivery wagon of a rating of 1,000 pounds would do the work. True, there would be times when the load might crawl up to 1,500. Regarding the question of speed, Newmotor said, "My old horse is able to travel at about three miles per hour, taking an average of the work done in a month. Why should I desire to make my automobile travel more than three times this speed?"

* * * * *

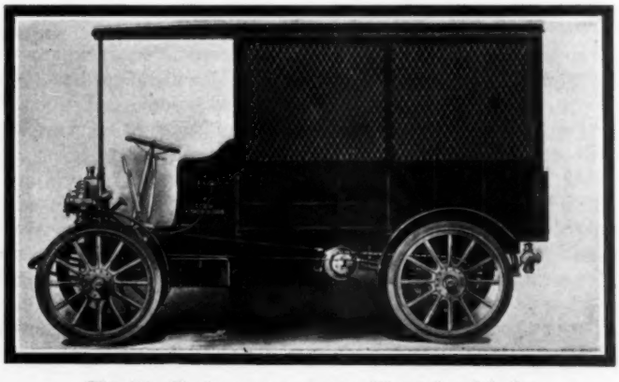


Fig. 36—Clark power wagon with enclosed body

"How are you to-day, sir?" This was the greeting that Newmotor received from the amiable salesman of the first company that he made bold to call upon.

"Quite well, thank you. How are you?" said Newmotor.

"Bully! What's doing?"

"I am looking for a freight automobile; one that will do my work. I am a general contractor."

"Want to carry ladders, cement, plaster, brick, tools, hardware, men and all of that sort of material, etc. I know your wants just like a book! We make a specialty of delivery wagons for just this kind of service. What you want is a light delivery wagon with a 'special' body. One that will 'get around.' Our make of automobile will go at 30 miles per hour. With this type of car it will be possible for you to make the whole round of the morning within a couple of hours. You will then have the rest of the day to expend in some other pursuit. The

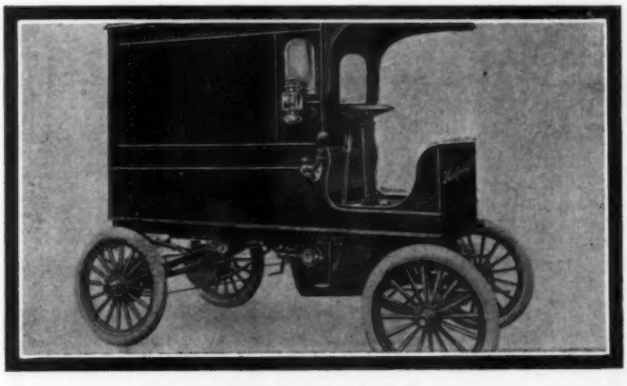


Fig. 37—Hatfield light delivery wagon

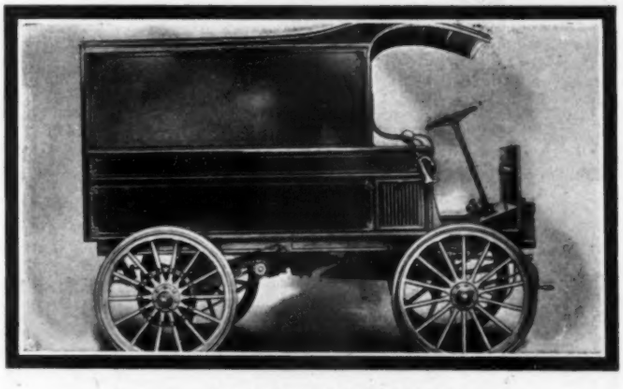


Fig. 38—Cortland delivery wagon

car that I recommend is fitted with pneumatic tires. If you so desire we will furnish a convertible body so that you can use the car on Sunday—you go to church, I am sure?"

"I may go to church! I am here on business! The automobile laws would be violated by me if I purchase the automobile you recommend! I do not belong to the class of people who brag about church-going on Sunday and violate the laws of the land on week days."

"You fail to appreciate just what I mean. The car will travel fast, it is true, but you do not have to make it go fast unless you so desire!"

"I have not the time now to go into this matter with you. I thought that you would have settled all of these matters; you being an expert; some other day, when my time is my own, I will be glad to come around and tell you why I am not interested in your type of freight automobile!"

* * * * *

Newmotor walked out of the first place with wonder in his eye. Could it be possible that a man would be in the automobile

business who would know so little as to offer a racing automobile to a "prospective" whose absolute need is confined to freight automobile service? Newmotor was surprised, but he was not discouraged. In the middle of the next block it was his misfortune to strike another place where speed was the main idea.

"I am glad to meet you, Mr. Newmotor. You say that you are looking for a freight automobile that will do the work of a general contractor. What is the particular nature of your business?"

"I do general contracting work over a sparcely settled territory covering 40 square miles. It is necessary for me to get around to every job that I have under way at least twice each working day."

"I have it! What you should get is one of our touring cars with a special body so designed as to enable you to use the car for delivery work during working days and for purposes of pleasure at other times!"

* * * * *

"You say that you do a general contractors business and that the load will be about 1,000 pounds; how much does a load of cement weigh?"

"I cannot tell you!"

"How much does a load of bricks weigh—say, 1,000 of them?"

"I cannot tell you!"

"How much does a load of kitchen ranges weigh?"

"I never thought of it!"

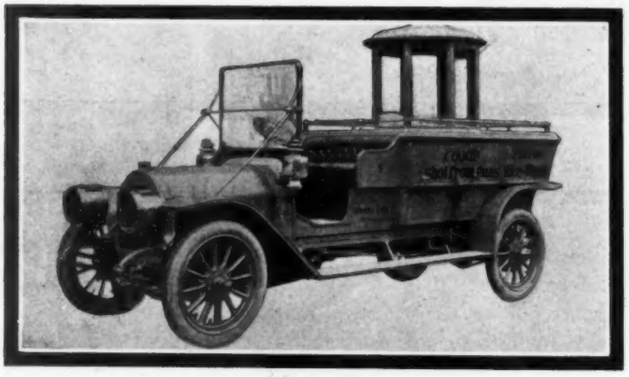


Fig. 39—Studebaker Garford delivery truck

Fig. 40—Garford patrol wagon

"How much does a load of painters' supplies weigh—say, kegs of lead?"

"More than 1,000 pounds, I am sure."

"How much does a gang of men weigh—say, 12 good-sized men?"

"Close to 2,000 pounds!"

"Would you not have some supplies on the wagon with these men?"

"No doubt!"

"What do you want with a 1,000-pound delivery wagon?"

"I begin to see that I may not care to have anything to do with such a vehicle. What do you think that I ought to get?"

"How about a one-ton truck?"

"Would it be of sufficient capacity?"

"Perhaps! It would have to be a good one!"

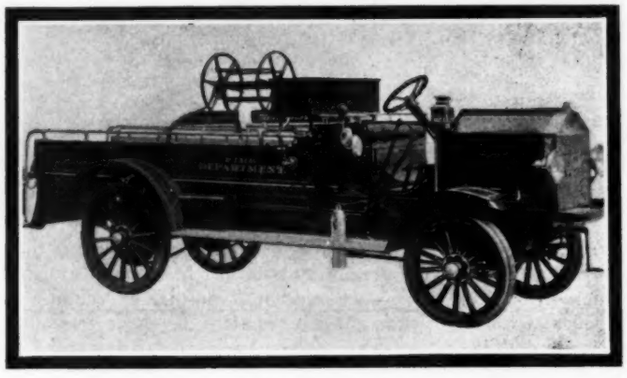


Fig. 41—Abresch fire department truck

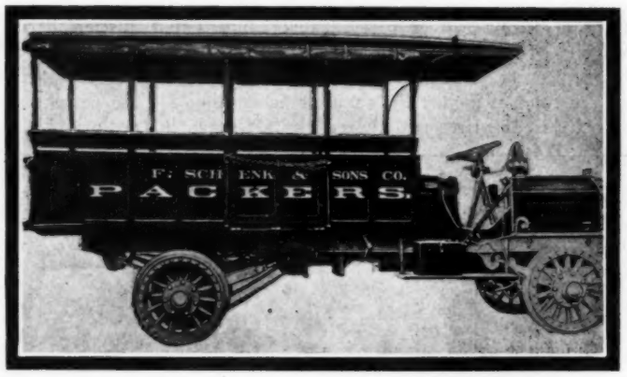


Fig. 42—Packers truck for three-ton haulage

"Have you a one-ton truck that you would recommend to me for this work?"

"No. The largest size freight automobile that we make is rated at 1,500 pounds. This automobile would not last long enough to warrant you in making the purchase under the conditions that it would have to serve for you."

"Too bad! I would like to deal with you."

"It is very good of you to say so, but you would change your mind within six months were I to fall into the idea!"

"What do you recommend for me?"

"Get a well-made one-ton truck. Be sure that it is incapable of traveling at a high speed!"

* * * * *

"Ah! Yes! I understand you, Mr. Newmotor. Very few men come into this office with the clear understanding of what they really want that you present. I believe I am equipped to show you that we are in a position to comply with your requirements."

"Mr. Salesman, of the Sensible Delivery Wagon Company, told me that he thought that you would be in a position to supply my need. I will be glad to see the truck that you have to offer."

"Right this way, Mr. Newmotor," leading the way to a well-lighted salesroom with the truck in the middle of the space where it may be examined all around with the minutest care. This is our regular make of one-ton truck."

"One ton, you say! With a 'stake' body! Speed, not over 10 miles per hour! Why should I accept a 'stake' body?"

"How long are the ladders that you use when you paint houses?"

"They are 'big' extension ladders!"

"How would you contrive to get them into a delivery wagon with a top?"

"It could not be done!"

"What are you making a purchase for—do you wish to make an exception of the very materials that will be the hardest to cope with? Would it not be better to arrange to deliver the heavy and

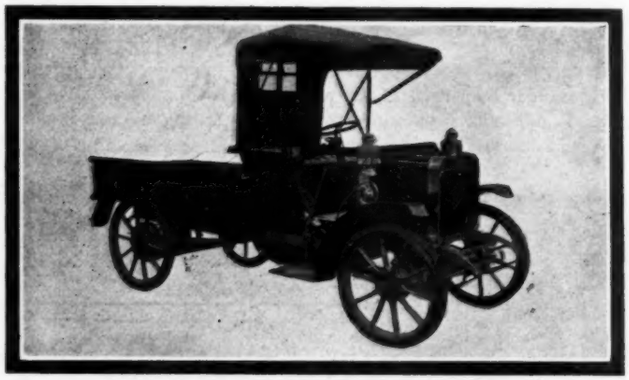


Fig. 43—Rovan truck with front wheel drive

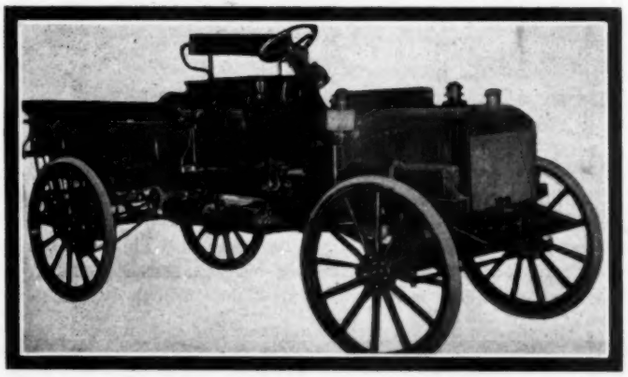


Fig. 44—Crown commercial open truck

cumbersome things and take out your trouble in connection with the small tools and supplies such as a messenger boy would be able to carry and take a street car?"

"But if I take this one-ton truck with a 'stake' body, I should be able to deliver all of the small tools and supplies, should I not?"

"Certainly! but this is not a rule that will work both ways!"

"Ah! Yes! I understand! You may get out for me one of this model of truck. I am satisfied that it is the best choice that I can make!"

Sunlight vs. Rubber

Tires Will Suffer if Subjected for Long Periods to the Direct Rays of "Old Sol"

SUNLIGHT has a deteriorating effect upon tires. Obviously it is impossible to avoid exposing them to the light when running the machine, but when standing it is the part of wisdom to favor them in any possible manner. To this end don't leave a car standing for hours where the hot sun will strike it—if you do you may find a flabby tire on your return, as an immediate result, with the ultimate ill effect not so readily overcome. It is far better to stop in the shade and walk a hundred feet to your destination.

And in the case of the car that is run mostly at night, it should be covered through the bright hours of the day when in the garage. The man with his private garage can obtain this protection by providing heavy shades for the windows. Sections of old carpet or rugs are excellent for this purpose.

Electric Conductors Require Consideration—When the ignition system of an automobile motor is being installed, if it is to give lasting service, attention must be given to the details of stringing the wires and making the joints. It is not a good idea to use short lengths of the cable owing to the difficulty of so joining the insulation as to preserve the integrity of the same. If the joints are well made, mechanically, there is no great difficulty attached to making the electrical contact as good as the solid section of the wire, since soldering can be resorted to. Reverting back to the insulation, it is not difficult to obtain electrical conductors that will show a breakdown test of from 27,000 to 30,000, which is amply high for every purpose, but it cannot be shown by any process of reasoning how the insulation at a joint, even when it is well made, will be equal to the solid insulation. Besides using uncut lengths of wire, it remains to properly fasten the leads in place, partly to keep them from bellying down, looking unsightly, but, in addition, in order to prevent the chafing of the insulation and the making of "ground" contact, which will destroy the value of the wire for the work it is installed to do.

Some short circuits are exasperatingly hard to locate—so much so that many a car has been rewired because of inability to find one. As a last resort (and sometimes before) start up

Fig. 45—Monitor truck with low-sided body

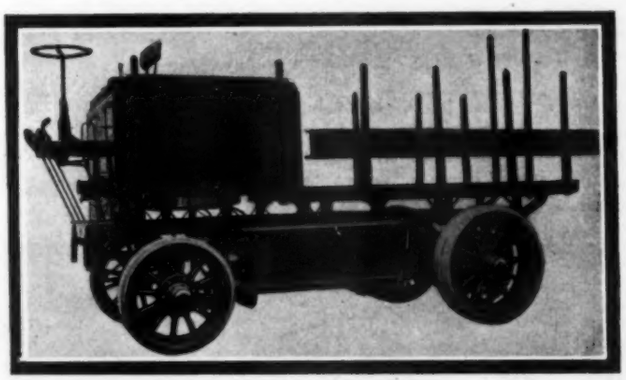


Fig. 46—Studebaker Model 24 electric stake truck

the engine in the dark and look for a spark that shouldn't be.

It is quite possible to show class in little things; a man who has regard for the niceties of the business does not put a rough forged or cast end of a jack against an axle without a doubled rag or piece of waste intervening.

Don't let the enemy choose the battle-ground; it might prove to be an ambush.

Fig. 47—Martin box delivery wagon

Painting Freight Autos

M. C. Hillick Takes a Hack at the Finishing of Delivery Wagons

BEAUTY, as it relates to passenger automobiles, is on a different basis from what it should be when freight automobiles are considered. In the latter beauty is as beauty does. The fact that an automobile is devoted to the transportation of goods is no ground for assuming that it should be finished like a wheelbarrow, moreover it must be remembered that the harder the service the more reason there is for desiring to preserve the surfaces against the ravages of rust, chemicals and rough handling. In view of all of the attending conditions, it is believed that freight automobiles should be finished with even more care than that which is given the passenger types of cars, but while the work is being done there is no sense in neglecting to make it look artistic.

In the range of color selections for this class of vehicles there is scarcely a limit. The entire domain of color is being apparently drawn upon to meet the requirements of the situation. While it has already been shown in these columns that the colors employed upon the purely pleasure automobiles are comparatively few in number, quite the reverse is true of the commercial automobile, which in addition to its usefulness as a "burden bearer" has a distinct and important value as an advertising possibility. Indeed, some of these paneled top commercial automobiles are lettered and ornamented to an extent fairly rivaling a New Jersey billboard.

It has come to a pass where the painter must not only be an "expert brush hand," but a high class colorist, and a forager in the wide and luxuriant field of art. As a matter of fact, this field of painting, with its many sided ornamental attachments, offers fairer promises to the painter than almost any other.

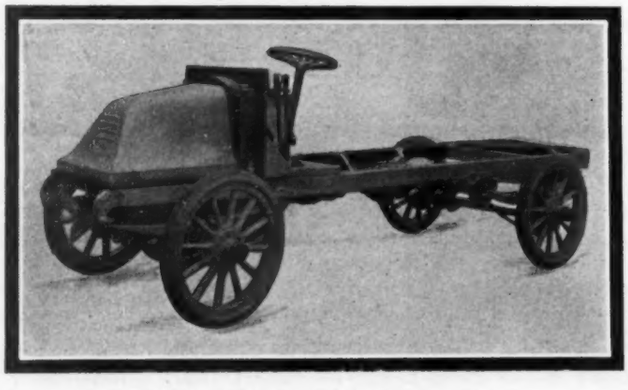


Fig. 48—Chassis of the Adams truck

However, with all the imposing list of colors at his disposal the painter, and back of him the manufacturer, of automobiles has need to bear in mind that it is not altogether in the multiplicity of colors or of designs ornamental that his success with the public is destined to work out. For, after all, the recent exhibitions above referred to have proved that what has pleased the public most, next to excellence of mechanical features, is that fashion of painting and ornamenting which has embraced a simple, comprehensive combination of colors, illuminated by ornamental characters worked out in a style that "he who runs may read," or, to put it in another figure of speech, that the bystander may read as the automobile flashes past. In commercial automobile painting this is the telling factor invariably, and it must continue to be.

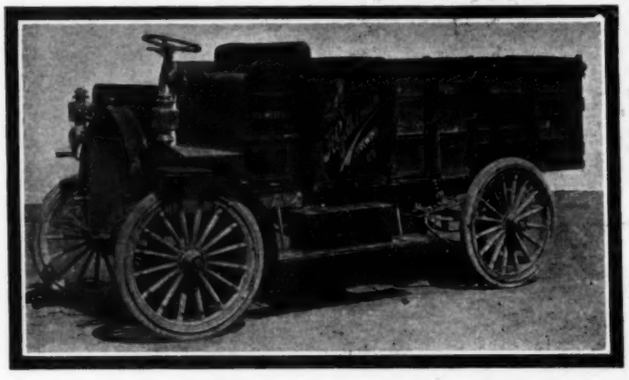


Fig. 49—Stephenson utility truck

Distribution of colors should be made, and by expert colorists will be made, according to style and design and to the class of service to which the vehicle is to be assigned. This may, and, in fact, in a majority of cases does, necessitate the use of two or three, or possibly more, colors upon the one car, but so long as those colors do not antagonize one another or render the combination inharmonious, at the same time preserving the simplicity characteristic of art in its best form, the design cannot fail to fulfill its mission.

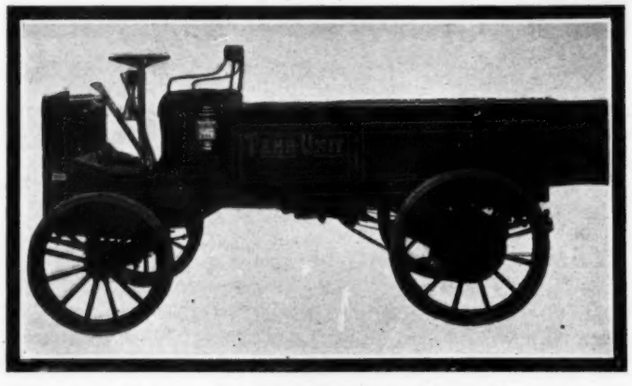


Fig. 50—Penn-Unit one-ton truck with open body

First, then, we must recognize in painting the commercial automobile that the work is intended both for protection and advertising purposes, and, regardless of the number of colors employed, the whole color and ornamental scheme must be subordinated to a simple, instantly understood style perfectly in keeping with the service to which the vehicle is to be assigned and with direct reference to the speed ordinarily attained by it.

Not a few of the commercial cars exhibited at the Madison Square Garden show, and likewise later at Chicago, failed in this particular, which failure in the months to come, as publicity

and protective purposes clamor insistently for recognition, will doubtless be rectified.

On the whole, nevertheless, the painting and general ornamental work displayed upon the truck and commercial automobiles offered for inspection at the recent shows made these vehicles attractive to an extent undreamed of before.

The lesson to be learned from these exhibitions is: First, that durability is a prime, even an indispensable, requisite; that brilliancy and color tone appeal to every one, and that, finally, ornamental lines, decorative and pictorial effects, accompanied by artistic lettering, constitute main features of the commercial automobile painter's business.

Here arises the question: How is durability under the present quick system of painting to be attained? Briefly, we reply:

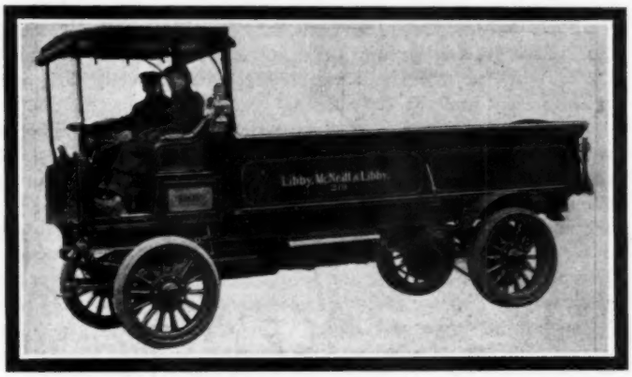


Fig. 51—Kelly truck with cab to cover driver

Bring up the first coatings—the primer and its two following coats of surfacer—with plenty of elasticity, which only pure raw linseed, divested of all foreign matter, is capable of furnishing, this applying to either the wood or the metal surface. In the case of wood let the oil be served in enough pigment, preferably white keg lead, to prevent it from penetrating the

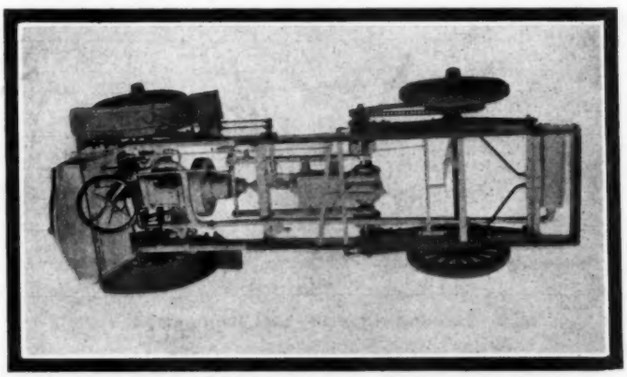


Fig. 52—Chassis of the Sternberg truck; plan view

wood too deeply, thereby weakening its capacity to support the subsequent coats of pigment. For the metal surface dilute the oil with a sufficiency of turpentine to enable the oil to dry in season and retain the necessary amount of elasticity. Give the first coats, and, for that matter, the coats immediately following, time in which to dry to the proper turn, for thereby hangs the tale of tough wearing surfaces. Grade the second coat of surfacer, in point of elasticity, just a degree below the first coat, making it in a word about equal parts of raw linseed oil and turpentine, and using, naturally, a larger body of pigment for grain filling and "bodying up" purposes. For the third coat of primary surfacing material the oil supply should still further be reduced so that when ready for application it may contain about one part oil to seven parts turpentine, with enough lead pigment to afford good surfacing properties. In case a system of patent, ready-to-use surfacers are employed, and we

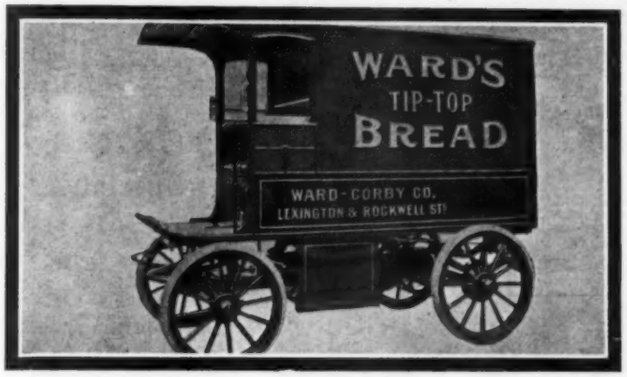


Fig. 53—Ward electric delivery wagon

may say, in passing, that they are largely employed in some parts of the country, at least the same thoroughness of application and surfacing should be expended. For the body surface to be worked up in first-class shape—and practically all paneled top cars must be so brought up—use four or five coats of rough stuff. Rub this foundation very carefully with water and artificial pumice stone. In the field of colors for the freight and commercial automobiles we have among the naturally solid or opaque pigments Indian and Tuscan red, English and American vermilion, automobile red, Cochin red, green in at least fifty different shades, golden ochre, chrome and lemon yellow, with innumerable variations from these, two dozen shades of blue, browns to the extent of a dozen shades, and grays in at least a half dozen fashionable shadings.

In transparent colors the lakes and carmines and maroons furnish beautiful and fetching fields of color, all of which, along with the opaque colors, require a robust body of varnish to display and protect them.

A New Chromium Alloy—The composition of a new alloy styled Chromax-Bronze, stated to have a tensile capacity of 78,950 lb., is as follows:

Copper	110	pounds
Nickel	25	"
Zinc	20	"
Chromium	5	"
Aluminum	5	"

It is made thus: Five pounds each of chromium and of aluminum are melted together in a graphite crucible. This occupies about one hour. To this are then added 110 lb. of copper, and the heat continued about 30 minutes to melt the mass, after which 25 lb. of nickel is added. When the nickel has melted 20 lb. of zinc is introduced, the while stirred and poured into ingots. The alloy has a light reddish hue.—*Motor Trader.*

A Pertinent Pointer to the Tyro.—Dirt may cause the auxiliary valve to stick—a point easily tested with the finger. The valve seat, if not of metal, may leak, causing a weak mixture at low speeds.

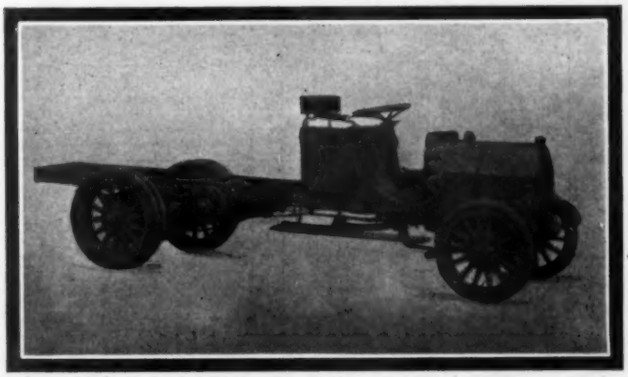


Fig. 54—Chassis with driver's seat of the Hart-Kraft heavy truck

Worm Drive for Commercials

Being an Exposition of This Form of Final Drive in Its Special Application to Business Vehicles*

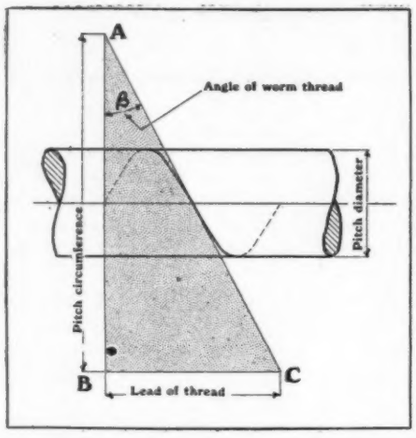


Fig. 5—Graphic construction showing the angle of the worm-thread pitch circumference and lead given

AMONG the many hotly debated points relating to the construction of motor vehicles, none has been more strenuously contested than the design of rear axles. The combatants have been roughly divided into two camps: "solid axleites" and "live axleites," the "solid" party being subdivided into "chain drivers" and "rack and pinionists," whilst the "live" party consists of "worms" and "bevel drivers." The merits of each type of drive and the answer to the question of "which is the best" for commercial vehicles are not subjects that can be reduced to formulæ, because so much depends upon the conditions of service for which a chassis is intended when taken over.

It will be generally admitted that, provided the vehicles are operated over "made" roads, and the wheels are fitted with solid-rubber tires, "live" axles in many instances are suitable for the following two classes of machines:

(1) Passenger-carrying vehicles, either for public service or private hire.

(2) Goods vehicles up to four tons capacity.

Solid axles will generally be found more suitable for vehicles of the following classes:

(3) Freight vehicles for loads exceeding four tons.

(4) Colonial types which demand good ground clearance.

(5) Vehicles with steel-tired wheels.

We do not intend, in the course of this article, to deal with vehicles in classes 3, 4 and 5, and, so far as concerns classes 1 and 2, it is our present purpose to discuss only that type of "live" axle in which a worm and worm-wheel are employed, as is now in use on a large number of London motorbuses. The development of the worm-drive for such vehicles has been the natural outcome of the high standard of silence which was set by the licensing authorities at Scotland Yard. This type of drive can be made more efficient, and it will run more quietly than bevel gearing or any other form of drive, provided, of course, that the worm and worm-wheel are correctly designed, accurately cut and carefully fitted.

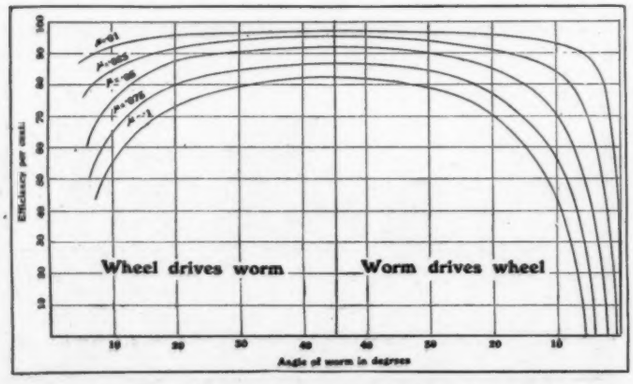


Fig. 1—Curves plotted to show the percentage of efficiency for different degrees of worm angle

In the course of such a short article as the present one, it would not be possible to deal with the technical questions of worm contact and tooth-design. In most cases, manufacturers will find it better to obtain cutters from first-class tool-makers, and not to attempt to produce such cutters in the tool-rooms of their own factories.

The design of a worm and worm-wheel should be governed by many opposing factors, and, to a great extent, it resolves into a question of "give and take." The controlling points, however, may be summarized as follow: (a) Available space; (b) efficiency; and (c) facility for taking up end-thrust.

Available Sp ce

The available space will be determined by the required ground clearance and the diameter of the road-wheels to be employed. The average requirements of a three-ton vehicle demand that it shall have tires with a maximum diameter of about 40 inches, thus giving a distance of 20 inches from the center of the worm-wheel to the ground.

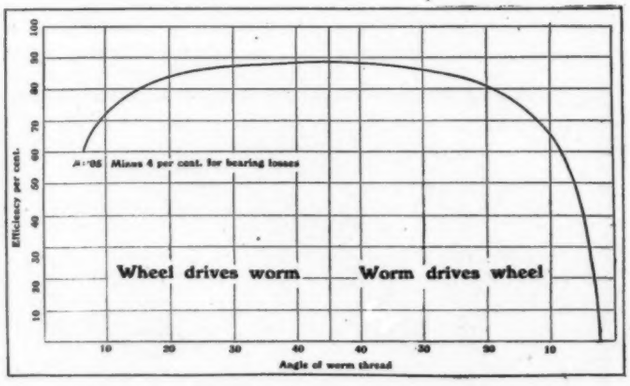


Fig. 2—Curve showing the safe limits of pitch angle

If allowance is to be made for a clearance of 12 inches when the tires are new, a distance of 8 inches is then left for the outside radius of the axle casing, and, if the casing is constructed in the form suggested later, the available space left for the worm-wheel allows for its having a maximum overall diameter of 13 1-2 inches.

Efficiency.

The efficiency of a worm and wheel depends upon the nature of the materials employed, the rubbing speed of the thread, the tooth formation, the intensity of pressure between the teeth of the worm and worm-wheel, the conditions of lubrication and the thrust and journal friction. Taking into account only the

*From "The Commercial Motor" (London) of Feb. 23.

rubbing of the threads upon the teeth, the efficiency may be calculated as follows:

$$\text{efficiency} = \frac{1 - \mu\frac{P}{\pi D}}{1 + \mu\frac{P}{\pi D}}$$

In this formula μ is the coefficient of friction, P the axial pitch of the worm, and D the pitch diameter of the worm. If the materials employed be good phosphor bronze for the worm-wheel and hardened steel for the worm, and the conditions of lubrication be good, the coefficient of friction may be taken as .05, and the curves which are shown in Fig. 1, plotted by Mr. C. W. Hill, are based on that figure; the results compare favorably with those for spur gears which are run at similar pitch-line speeds. These curves show only the internal losses in

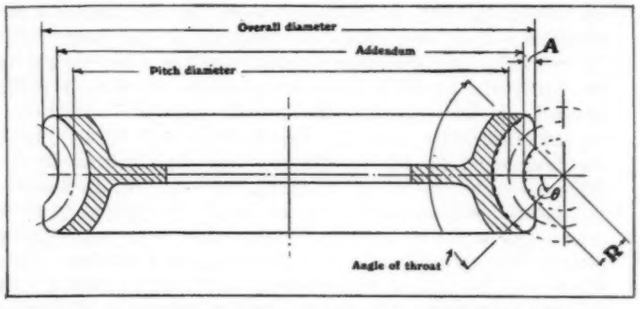


Fig. 3—Showing inclined angle of worm-wheel throat

the worm and wheel, as represented in the above equation, and about 4 per cent. must be deducted for the frictional losses in the thrust and journal bearings; after this deduction has been made, the curve shown in Fig. 2 is produced. From this curve it may be seen that the safe limits for the pitch angle of a worm are 20 degrees and 45 degrees. Between these two limiting angles the gear would be both efficient and reversible, thus enabling the worm-wheel to drive the worm. The pitch angle, however, cannot be decided without taking into account both the space available for the worm-wheel and the gear ratio which is required. In most of the smaller types of vehicles a reduction of three to one between the engine and road wheels is sufficient if a direct drive be employed on top gear, and, in such a case, it should not be a difficult matter to choose a suitable angle giving the desired reduction with an even balance between end and side thrust. When, however, we come to consider a three to four-ton chassis, such as a London bus chassis, in which a reduction of eight to one is required, the angle must be selected with great care, because, as already stated, the overall diameter of the worm-wheel must not exceed 1 1-2 inches.

The largest possible area of the wheel teeth should make contact with the worm, so as to keep down to a minimum the intensity of pressure between the sliding parts. The lower the intensity of pressure and the more efficient will be the running of the worm and wheel; further, lubrication will be more easily maintained. For this reason, therefore, the included angle of the worm-wheel throat, as indicated in Fig. 3, should be about 90 degrees. If the worm be made of 3 per cent. nickel steel, its smallest diameter should be not less than 2 inches, and, having decided on this dimension, we may next proceed to ascertain the largest permissible normal diameter over the teeth of the worm-wheel. This dimension may be obtained by deducting from the overall diameter twice the distance marked A in Fig. 3, which distance may be calculated as follows, the letters used indicating the dimensions which are similarly marked on Fig. 3:

$R - A = R \cos\theta$; and, as $R = 1$, and $\cos\theta = .7071$, therefore

$A = 1 - .7071 = .2929$ inches.

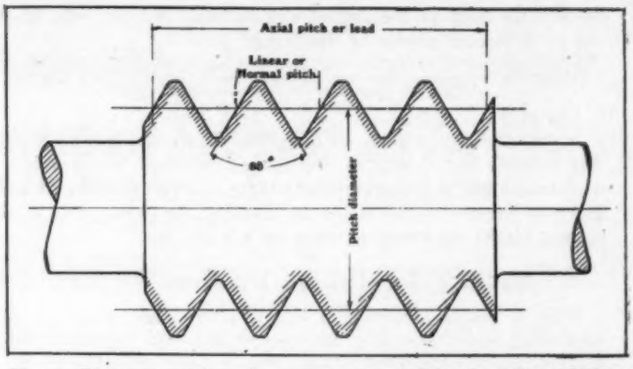


Fig. 4—Diagram section of a worm presented to show the relations of pitch to lead

The maximum normal diameter over the teeth of the worm-wheel, therefore, is 13 1-2 — 2 x .2929, or 12.914 inches. It must, as a matter of fact, be slightly less than that dimension, in order to allow for the necessary clearance between the tops of the wheel teeth and the bottoms of the threads of the worm.

The next step to take is to decide upon the number of teeth in the worm-wheel, which number, it must be borne in mind, should be a multiple of eight—the ratio of reduction required. A reference to a table of standard gearwheels will show that 32 teeth of 1 3-16 inches circular pitch would be the largest permissible wheel. Such a wheel gives a normal outside diameter (addendum) of 12.85 inches with a pitch diameter of 12.095 inches.

The next thing to decide upon is the pitch diameter of the worm, and, as we have already assumed a minimum root diameter of 2 inches, and have decided on 1 3-16 inches normal pitch as being a suitable size, it will be found that the pitch diameter is, approximately, 3 inches. Let us decide on exactly 3 inches as the pitch diameter, and, having decided this dimension, we can then proceed to find the lead and the pitch angle. The lead may easily be found by dividing the pitch circumference of the wheel by the gear ratio, e. g.,

$$\frac{\pi \times 12.095}{8} = 4.75 \text{ inches.}$$

Fig. 4 is a diagram intended to show what is meant by pitch angle. Let us assume that a strip of paper is closely coiled round a drum which is 3 inches in diameter. If this drum be then caused to rotate, and the point of a pencil be so held as to inscribe a line upon the paper, it will be found that, if endwise motion equal to the lead of the worm be given to the pencil during one revolution of the drum, the inscribed line will be a complete helix: if the paper be then unwound from the drum and be laid out flat, the inscribed line, together with two other lines representing the longitudinal and transverse axes of the worm, form a triangle (ABC) as shown in the diagram. The tangent of the angle (β) may be obtained by dividing the length of the side BC by the length of the side AB. The side BC rep-

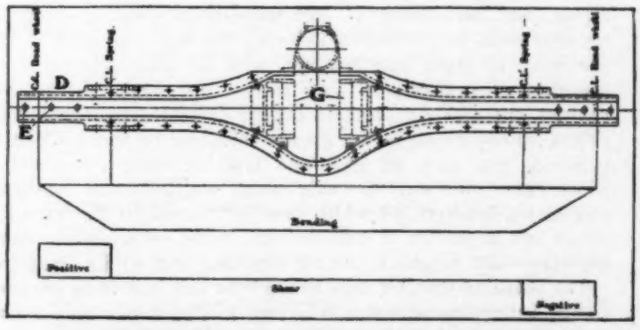


Fig. 6—Pressed steel casing for a worm-driven live axle

resents the lead of the thread 4.75 inches) and the side of AB the pitch circumference of the thread (3π).

$$\text{Tan. } \beta, \text{ therefore} = \frac{4.75}{11 \times 3} = .504$$

A reference to a table of tangents of angles will show that this number represents 26 degrees 45 minutes, which angle is well within the limits prescribed in Fig. 2. The number of leads given to the worm is decided by dividing the axial pitch by the normal pitch; they may be right or left-handed.

Facility for Taking Up End Thrusts

With a worm gear which has a pitch angle equal to that which we have described, the end thrust will be considerable, and, on the low gear, if it has a total gear reduction of 27 to 1, there would be something like 3,000 pounds on the worm, and about one-third as much (side thrust) on the worm wheel. These thrust pressures, however, need not cause any anxiety, as good ball-thrust bearings may easily be arranged to take the loads in both directions. As the side thrust on the worm-wheel is frequently reversed, the worm-wheel flange should be placed between the two halves of the differential gear casing, and should not be bolted on to one side in the manner of a bevel wheel, as, if the wheel were fitted in the latter manner, the bolts would be placed in tension as well as in shear.

The Casing

Having decided upon the general form and dimensions of the worm and worm-wheel, a not less difficult problem is now presented; that of providing them with a casing which will keep the alignment of the parts and maintain the pitch centers at their proper distance. It should also have suitable recesses for thrust and journal bearings, should be strong enough to support the load and to take both the torque and driving effort, should be light, and, last but not least, it must be a commercial proposition from the manufacturing point of view. Until quite recently, live-axle cases were usually built up of two trumpet-shaped casings, which were bolted together with the flanged joint on the longitudinal center line of the chassis. Spring brackets were sometimes cast integral with these casings but more often the spring brackets were carried on steel tubes which were pressed into the trumpet-shaped casings. This type of axle suffers from two inherent defects: one is that the cast metal casing cannot conveniently be made of suitable shape to withstand heavy stresses either in tension or in shear; the other is that fatigue is very soon manifest, owing to the rapid vibration to which an axle is subjected, and, consequently, fracture sooner or later occurs near a change of section in the casing. These difficulties undoubtedly retarded the adoption of live axles for heavy commercial vehicles far more than did the minor troubles of noisy bevels and rapidly-wearing worm gears, and the then tried remedies of increased thickness of the metal casing (involving greater unsprung weight upon the tires) and the provision of tie rods (which generally worked loose) were worse than the evils they were intended to cure. As in many other instances, improvements in other branches of engineering brought help to the harassed motor vehicle designer, and the advent of high-temperature welding methods, together with improvements in heavy presses, was quickly appreciated by light car builders who at once proceeded to manufacture pressed-steel axle cases. For heavy commercial vehicles, the pressing of these casings presented increased difficulties, chiefly owing to the greater thickness of metal which is required, but, now, at least one type of vehicle is running which has a mild steel live-axle casing with which is incorporated spring brackets, yet which does not necessitate the use of a single bolt in tension or that tie rods, to the use of which most engineers take exception, should form any part of its structure.

The shape of the case may be made to suit individual requirements, but the form which is shown in Fig. 6 has been found very successful on a three to four-ton lorry which has been tried over some of the worst roads in England and America. If we neglect the weight due to the worm and differential, the bending and shear stresses, due to the weight of the vehicle and its load, will be shown in the diagrams below the view of the axle casing. From these diagrams it will be seen that the greatest strength is needed between the spring centers, and provision for this may be made by increasing the diameter of the casing toward the center. The weakest points are where the axle enters the road wheels, as here the diameter must be reduced, in order that the hubs may be of reasonable size, yet this occurs at positions in which the shear stress is considerable. Increased strength will be obtained if the flanges (D) are continued right through to the ends of the casing, in order to provide journals on which the wheels may run, these sleeves being held in position laterally by stop pins (E). This method of construction facilitates the machining of the parts, and they are also easily renewable. If ball or roller bearings are employed they may be fixed direct onto the casing, and sleeves would not then be necessary.

The bearing housings for the inner ends of the differential shafts may be made as mild-steel stampings (G), which stampings may either be welded or riveted to the main casing. Theoretically, the thickness of the complete main casing may be less in the center than at the ends, on account of the increased diameter toward the middle, but the reduction in weight effected by such thinning of the metal hardly justifies the expense of having the plates rolled after cutting them to shape. In the process of stamping, however, the thickness of the material will be reduced in the center by from 10 to 15 per cent. The two halves of the casing may be welded together instead of bolted as shown. This necessitates that the driving shafts shall be pushed through from each end, and some fixing must be provided in order to keep them in position. The bolted casing is preferable for many reasons, one of which is that the flanges greatly add to the strength of the casing.

As we pointed out when dealing with the question of ground clearance, it would be impossible to place the worm under the worm-wheel, and, indeed, the attendant disadvantage of a sloped transmission shaft, or the alternative of excessive angularity on the cardan-shaft joints, more than offsets the advantage of better lubrication which is generally assumed to exist when the worm is below the wheel. The worm box, which may best be made of cast steel or malleable cast iron, may be made with the joint just below the bearings, thus enabling the box to be removed bodily without disturbing the thrust or journal ball races. These races should be of large diameter and of ample strength; further, they should be kept as close to the worm as possible, and a double thrust bearing should be mounted at one end of the worm instead of a single thrust bearing at each end.

With regard to the first cost, a worm-driven live axle has been found to be as cheap as one with a bevel drive. The running costs will depend largely upon the conditions of service, but a worm and wheel approximating the dimensions we have given have been running for over 10,000 miles with an average imposed load on the platform of 3 1-2 tons, and, after that mileage, do not show signs of undue wear. A worm and wheel can be produced for considerably less than the cost of a pair of silent chains and their necessary wheels and sprockets. Doubtless, further improvements will be made, and worm gearing, which, until quite recently, was looked upon as impossible by many people because they did not understand it, will be adopted—not only for back axles, but many other types of power transmission.

Repairman at a Disadvantage in Producing New Parts.—That a repairman will be able to produce parts which will be better than those to be had from the maker is scarcely to be believed. The repairman works under the greatest possible disadvantage; he is not in a position to select intelligently the materials, and he is without the working drawings from which the parts were originally made, so that "rule of thumb" and methods involving surmise will represent the boundaries of such efforts.

When Judgment Whispers Don't When the Senses Are Dulled

Even an Alarm Clock Fails of Its Purpose. Don't Select Such a Poor Time for the Conduct of Important Negotiations

Don't eat of the fruit of pleasure as it is represented in an automobile if you have to invest in the bitter fruit of a mortgage on the home.

Don't leap into debt—it is like climbing a greased pole to get out again.

Don't debauch the senses—it takes a keen wit to dodge a scamp's wiles.

Don't decamp from the school of experience with a dunce's cap.

Don't rush off to the patent office with a decayed idea, or invest in one that is paraded before your fancy.

Don't demur if you want a good automobile and some reputable maker offers to supply the demand.

Don't fish for compliments in the brook where they grow so thick that they impede navigation.

Don't deal with a man whom some evil beast has devoured.

Don't toy with dexterity—it is the weapon of the sharp who juggles with your credulity.

Don't apply ointment to a sore spot on an automobile—get a screw-driver and go to work.

Don't enter negotiations for the purchase of an automobile with a man who has a short, thick brain.

Don't invest in a harmony on four wheels—what you need is a silent steed.

Don't use outlaw language upon an obdurate motor—the only language it will understand is founded on common sense.

Don't sit upon delusions for a lifetime expecting to hatch out birds of wisdom.

Don't cover up your hat-band with crepe if a poor lamp departs uninvited from its bracket on your automobile.

Don't invest in a heap of ideas—look for an orderly array.

Don't marry a frivolous automobile—"A light wife doth make a heavy husband."

Don't select an automobile that is a heretic—you can't tell where it is bound for.

Don't be too ready to return, in coin, the hospitality of the spider of the second-hand web.

Don't sit at the wheel twixt wake and sleep—instead of bowing to sense it is nodding to the grave.

Don't tumble from a tower—slide from a mole-hill.

Don't fail to tread lightly when passing the cradle of cares—they are notoriously light sleepers.

Don't partake of the substance of the poisoner—invite him to sample his own wares.

Don't keep a tryst with a pole-cat—he will sell you an automobile that will have no need for a horn.

Don't deal with a saint if his wicked partner can be located.

Don't deny yourself enlightenment of the fact that there is a path that leads to foul knowledge.

Don't ogle a decrepit car—let the owner have it to himself.

Don't persuade yourself that it is a sin to covet honor.

Don't know an automobile by its *nom de plume*—learn of its real name.

Don't invest in an automobile that is on the way to keep an appointment with death!

Don't take it for granted that all the heavenly choir stands mute, listening to a lying tongue describing the good qualities of a "junker."

Don't parley with a mutinous automobile—perform a surgical operation.

Don't acquire such a taste for mush that you will be willing to accept it in place of steel in the crankshaft of your automobile.

Don't place your brains in a leaky quart measure and send the can in quest of an automobile for your use.

Don't step out of a balky automobile, down into the mud of the road, make a low bow, and say: my master!

Don't attend a masquerade with money hanging out of your pocket—there are plenty of places where they have good automobiles to dispose of.

Don't imbibe in the temptations of prosperity—prudence is then the most valuable commodity.

Don't forget; while the smith stands, the iron cools on the anvil.

Don't be drowned in consternation if the salesman tells you that his make of automobiles are all sold out: he will find some way to favor you if you insist!

Don't strike out the knowledge of logic which says: "conjugates may be in name only"; think of the conjugate of the salesman's description and the automobile that he may be slandering!

Don't denigrate the automobile that you see in your mind's eye, substituting the one that is offered instead.

Don't marry an automobile before indulging in a short courtship.

Don't elope with a runabout if you prefer a big limousine—the honeymoon will be studded with nightmares.

Don't take too kindly to the budding branch without inspecting the old lady—they are counterparts.

Don't imagine that the little things do not count—a stray nut will bounce the teeth off a gear.

Don't enter into a bargain with yourself to be satisfied with less than what you want—you will be a welcher.

Don't imagine that reminiscent smiles will play around the wrinkled brow of a decrepit second-hand automobile—the creaking of old age is about all that should be expected.

Don't purchase a number six hat for a seven and one-eighth head, nor a runabout to do duty for a touring car.

Don't incur a tire bill for a touring car if all that you need is the service that a runabout is thoroughly capable of rendering.

Don't invest in a noisy automobile because it is cheap—the cost of the (noise) canning factory will represent more than the saving.

Don't turn up your aristocratic nose when you are lying back in the richly upholstered tonneau and you pass a pedestrian by—the rain might come in and water-log your brain.

Don't take it for granted that a peek-a-boo front on an automobile is a sure sign of an efficient radiator—try it out on a retarded spark for ten minutes.

Don't assume that an automobile is in good working order just because it will run—it may be ailing in a dozen ways—look it over.

Don't put grease in the grease cups on top of old accumulations—there is no telling what might be the result.

Don't gather the impression that it is too much of a good thing to examine all the automobiles in a certain class before making a selection—turn over the last stone.

When the Motor Failed

Jackson Called Upon His Friends and When He Had More Advice Than He Could Masticate He Went to the Repairman with His Troubles

WHAT happened to Jackson is the gist of the subject. Jackson, not being able to wait until the sun was shining on both sides of the street before purchasing a new automobile, went to the "Garden" with his mind made up to do or die, and having satisfied himself of the fine-grained proportions of an automobile that was being admired by the passing throng, he accosted the accommodating salesman of the same, who soon had Jackson dangling at his belt. But the salesman was not a red Indian and Jackson soon found that he was fortunate in having attracted the notice of his captor. The automobile proved to be a good one, and it did not take Jackson long to discover that his health was steadily improving under the spell of his new acquisition.

But the fault that resided in Jackson's anatomy was a most grievious one; he was never able to let well enough alone. Within a month after he made his admirable purchase, Jackson was looking up his friends and acquaintances, telling them all about his new car, how it worked, why it went at all according to his version, and how it might fail to animate. Poor Jackson could not get it into his unmechanical head that the automobile would contine to go along about its business, even for a number of years, were he so designed that he would let it alone in its performance of the duty that every good automobile recognizes as its legitimate function. But Jackson, being only a novice, had not as yet learned that automobiles have a being, just as has a locomotive, as every engine-driver knows, so that when Jackson tortured his automobile by casting doubt upon its good faith, he did not hear the automobile grumble and show that it felt grieved at the lack of confidence that its owner imposed in it.

True, automobiles do not talk the same language as that of men, but the fact remains that they do talk, and at times the language that they use is scarcely fit to print. On a few occasions those who do understand the language of automobiles might have heard this one going along the street grumbling as only an automobile can when it feels that it is being badly neglected or abused. Jackson was a nice fellow; he would never neglect his automobile were he to be able to understand its language and by hearing it talk learn of its needs.

"What cannot be cured must be endured" quoth the automobile. "That owner of mine is a dub," said the car one day. "Just think of it. I am as thirsty as a marooned sailor who would not know a drink if it was spilled down his parched throat, and yet my owner took me out for a long run to-day without giving me a drop of lubricating oil, although he did spill gasoline all over me, putting some of it in the tank. I could stand that. It is a part of my business, but I do not appreciate the idea of taking water in my gasoline. I take my drinks straight when I am invited to choose for myself.

"It is a strange thing, according to my way of thinking, that my owner will go on day after day making the same kind of mistakes. Were he to consult me, I would be able to tell him just what I need, but instead of doing that, what do you imagine he does? Well! You could never guess! He goes around among his friends (all of his caliber) and asks them all the fool questions that there are to be asked. What do they answer? Dear me, were I to have done to me all the things they talk about I would not be here! One fellow said (when Jackson told him that my cylinder-heads were a little warm) 'take out the spark-plugs and squirt hydrochloric acid into the combustion chambers."

Slowly the Winter thawed; gradually the sun shifted around; one day a robin came and rested on Jackson's window-sill, and the time was near when the friend of all (Spring fever) makes its welcome call. Jackson began to shift about and in many ways he showed that he was thinking of long tours.

Hesitating Between a Repair Shop and a Long Run

One fine day when the evidences of good roads and other desirable conditions for touring were too much in evidence to be denied, Jackson looked over his automobile, and finding nothing the matter with it, decided that it was on account of lack of skill on his part, cranked up the motor with the idea of rolling it around to a convenient repair shop for the purpose of allowing the accommodating repairman to lend the force of his skill to the search for trouble. As the automobile went spinning along by the repair shop without even hesitating, Jackson, under the spell of the rhythm of the motor and the weather, allowed himself to go along, and in the course of an hour the man and the automobile were well out into the country, away from the turmoil of the city, communing with the Nature that Spring ushers in for the good of man.

It was quite early in the morning when Jackson started out, and it was high noon when he entered a little town after a travel of 60 miles. Looking up at the town clock and noting the time, Jackson concluded that he must be in need of substance for the innerman, although he had been so much engrossed with the sport of the tour that he failed to remember that he was hungry.

At the next turn in the road a hotel that looked promising intercepted the line of vision of the happy tourist and he drew up in front of it with mirages of boiled chicken and other viands that are known to tickle the palate of tourists after a few hours of bathing in the ozone of life as it is found in the country. The repast proved to be all that a fastidious automobilist could possibly desire, and after lounging around for half an hour, the motor was cranked up again and with its radiator turned in the direction of home, the car went merrily along, hour after hour, with Jackson at the wheel enjoying life.

Just how long it took the car to traverse the 60 miles of return trip Jackson was unable to state, but he soon found himself before the very repair shop that he started out to visit several hours before. "By George," said Jackson, "I plumb forgot to take my automobile to the repair shop! What can be the matter with my memory?" It was too late in the day for Jackson to do anything more about it so he turned his automobile in the direction of his residence and in the course of ten minutes he was at home. Patting the automobile on the side affectionately as he left it in the garage, Jackson ran into the house by the side door, and greeting his sister, who was on the lookout for him, he said: "By George! Do you know that I had the time of my life; that automobile of mine never whimpered in a run of 120 miles."

* * * * *

Next morning, with another fine day before him, Jackson arose with the Sun, and, after taking a bath, making a quick job of dressing and partaking of an ample breakfast, he went out into the garage, opened up the windows, chased the cat out of the tonneau, and ended by looking at the car from three points of vantage. "I wonder what can be the matter with that automobile," said Jackson. "Do not seem to be able to find any trouble at all; my knowledge of mechanics certainly is below par!

But there must be something the matter with this car; I have had it now for three months, and having driven it almost every day, sometimes in the snow and sleet, I cannot get away from the feeling that it is in need of some attention. True, I started out yesterday morning to go to the repair shop and finding that the car would go all right I simply could not resist the temptation to go on—by George! That was a bully ride. Just think of it, 60 miles out and the same distance, and not a murmur!

"Well! I think I will go around to that repair shop and have a little talk with the foreman anyway; he might put me wise to something that will save me a peck of trouble in the long run." Jackson cranked the motor, buttoned up his coat, put on his gauntlet gloves, stepped into the car, adjusted himself in the seat, fiddled with the spark and throttle levers for a moment, tried the side levers, put a little pressure upon the service-brakes pedal, dropped in the clutch, changed from low to second, from second to high, adjusted the spark to an advanced position, supplied a little more air to the carbureter, took a quick glance at the tell-tale on the dash, and by this time he was a mile past the repair shop and making 30 miles per hour down a long road that was well surfaced, the end of which Jackson had never seen in his life of 23 years, although he was born in the near-by Jackson estate. It was a long, straight, level, well-ballasted road, ending 80 miles away by a river side. Jackson almost ran into the river ere he discovered that it was the only barrier between him and the adjoining estate.

"By George! Where am I at? This must be a deuce of a long way from home!" Jackson looked around and seeing a roadhouse down by the shore fell into the idea that he was hungry and that he ought also to get some directions such as would permit him to go home by some other route. The place proved to be a fairly good one, and Jackson pronounced the chicken prime. Luncheon over, after a short talk with the accommodating proprietor of the establishment, it was but a moment more and the automobile was on its way home, eager to get back before dark.

It was quite dark when Jackson rolled the automobile into the garage. With an affectionate look at the motor, he left the garage and ran into the house; greeting his sister, after giving the cat a roguish kick, he said: "Do you know I have the best automobile in the country; think of it, 160 miles to-day!"

* * * * *

Rain! Rain! Rain! Such was the complaint of Jackson for a whole week. Springtime and rain, who will say that Nature does not know when to weep! At all events, a bright Monday came at last. The roads dried up and with the sun shining brightly, Jackson, with greater eagerness than he ever exhibited before, made for the garage after a quick repast, and unlocking the door glanced at the automobile and said: "Well!" Dust had settled down upon the delicate finish of the torpedo body and the cushions looked neglected, but it did not take Jackson long to "clean her up." It remained to put lubricating oil in the tank, replenish the supply of gasoline, look in the radiator and see if the water level was satisfactory, which it proved to be, thus showing that the motor was of excellent design and that the radiator was large enough for its work. Jackson, after going over all the preliminaries, stood to one side, eying the car, and said: "I wonder what can be the matter with my automobile?"

The long wait, while the weather was clearing up, put Jackson in a bad state of mind; he was especially solicitous of the ignition system. After walking around the automobile five or six times at the rate of 30 miles per hour, he opened up the bonnet and examined the magneto all over. "There must be something the matter—I thought I heard a noise the last time I had the car out!" But the call of Spring was strong; it was impossible for Jackson to resist any longer, and cranking the motor, which was a particularly easy task on this occasion, he jumped in, muttering as he grabbed the wheel, "that he would go and see the foreman of the repair shop and have his views."

Had the foreman of the repair shop been a dentist, and the automobile a small boy, it would be simple enough to explain why the automobile did not even "look up" as it went by that repair shop, but a policeman, who was standing upon the corner, said: "There is no speed law that could look that car in the face at the speed it is going now!"

Jackson was happy. The automobile was singing a lullaby to him. He wanted for nothing but a continuance of the good weather that the "prophet" promised.

Distilled Water for Radiators

Description of a Simple Still with Which the Motorist May Produce His Own at Small Cost.

DISTILLED water in the radiator will prevent the formation of mineral salts and make for efficiency. In this connection the following scheme of securing a cheap supply of distilled water will be appreciated by every automobilist:

Buy from the drug store a length of rubber tubing of rather thick walls, large enough inside to go over the spout of an old tea kettle and long enough to lead from the tea kettle situated over the fire to a source of cold water, which, if the kitchen be utilized, will be the kitchen sink. Then buy a small diameter glass tube, which will fit one end of the rubber tube very tightly.

Next buy another and much larger glass tube, say, 1 1-2 in. inside diameter, but about an inch shorter, the first one being about 18 in. long. Another short length of rubber tubing of the same size, not over 2 feet long, will also be necessary.

Put the tea kettle on the stove, attach the long rubber tube, leading it over to the source of water, then slip the larger tube over it, and manage to hold it in that place by some means so that the cold water from the faucet can run in the upper or open end of the large tube. Hang the combination of the two tubes one within the other so that both are slightly inclined. The object of the inclination is to permit the cooling water to flow around the inner tube and then out to the sink drain. This flowing cold water will condense the steam in the inner tube, which will then flow through the shorter rubber tube (attached to the other end) to some convenient receptacle.

The process will then proceed as follows: Water put into the tea kettle will be converted into a vapor, steam, leaving the impurities behind in the tea kettle. This vapor will pass through the long tube to the glass, when the cold water flowing around the outside will condense it to a liquid again, which will then flow through the shorter rubber tube to the receptacle.

To dispense with the breakable glass tubes, get enough rubber tubing not only to lead to the sink but also to form several coils around the bottom of a tub or dishpan.

Painting Bodies

Metal Requires Different Treatment from Wood Owing to Its Lack of Receptiveness

THE automobile with a wood body, for first-class work, will receive, as a rule, at least fourteen coats of material to carry it through to a finish. For a finish of lesser quality, there is a system of correspondingly fewer operations, graduating down to as few as half a dozen coats, for what might be regarded as a "cheap" finish.

While the paint structure over the surfaces of bodies made of aluminum, sheet steel, etc., is built up from fewer coats than required upon wood, such painting must be most carefully adjusted and balanced out to a nicety and made to fit the negative surface upon which it is applied. There is a lack of receptiveness in metal, either aluminum or steel and a lack of the porous qualities of wood, both of which conditions the painter must study to counteract by special methods of mixing and application in order to realize satisfactory results in his work.

What Some Subscribers Desire to Know

The Editor invites owners and drivers of automobiles who are subscribers to THE AUTOMOBILE to communicate their automobile troubles, stating them briefly, on one side of the paper only, giving as clear a diagnosis as possible in each case, and a sketch, even though it may be rough, for the purpose of aiding the Editor to understand the nature of the difficulty. Each letter will be answered in these columns in the order of its receipt. The name and address of the subscriber must be given, as evidence of good faith, adding a nom de plume if the writer desires to withhold his name from publication.

Desires to Have Manograph Card Explained

Editor THE AUTOMOBILE:

[2,531]—I am somewhat acquainted with indicator cards as they are taken from steam engines, but I want to know how they differ from manograph cards as they are taken from internal combustion motors. Will you give me a little start on the right road? STEAM.

Buffalo, N. Y.

Referring to Fig. 2, a manograph card is traced just about as it would appear when taken from a good internal combustion motor. The several sweeps of the lines of pressures are so marked that you will be able to trace the relations without further trouble. An ordinary indicator would do the work were it not for the higher speed and the resultant inertia.

Discussing the Properties of Cork for Clutches

Editor THE AUTOMOBILE:

[2,532]—My clutch slips, no matter what I do to prevent the trouble. It is made of two plates. The gear is of the planetary type. Can you help me out? SUBSCRIBER.

Jersey City, N. J.

Yes! Drill holes in one of the plates of a size that will accommodate cork inserts. Fig. 3 shows a type of "cork insert" clutch with inserts as contrived by the National Brake & Clutch Company, of Boston, Mass., which works extremely well despite the fact that there are but three plates; moreover this clutch is used to transmit more than 50 horse-power. You can get plates from the manufacturer with cork inserted. Oil will leak out of the case and smear over the surfaces of the clutch. The cork inserts will prevent slippage under these conditions.

Creaking Spokes

Editor THE AUTOMOBILE:

[2,533]—I have a good deal of trouble with the spokes of my wheels squeaking, which shows that they must be somewhat loose. What can I do to overcome this? R. C. B.

Boston, Mass.

Tighten the nuts at the ends of the spoke bolts as shown in Fig. 4 and this may cure the trouble. If it does not answer, take the face plate off and pour some molten lead around the crevices and replace the cover. If the nuts work loose file the ends of the bolts so that the ends of the threads come flush with the nut. A center punch at the edge of the thread should stop any loosening.

Cure for Leaky Pressure Tanks

Editor THE AUTOMOBILE:

[2,534]—I have trouble with the pressure system of my car and have done every thing that I can think of to overcome it. I think that the loss is due to the filler cap, which is very small, and the washer does not find a good seating. What is the best form of washer to use? AIRTIGHT.

Scranton, Pa.

As long as the filler is so small, no matter what type of washer you use you cannot expect to get good results. Give up trying to find the philosopher's stone and fit a larger filler so that the washer area will be increased and thus prevent your trouble. In the filler shown in Fig. 1 it will be seen that it is large enough to pour gasoline into the tank quickly, the lugs permit quick detachment and the lower threads have been turned away so as to obviate the trouble sometimes encountered to find the right thread. The washer should be cut slightly larger than the diameter of the thread.

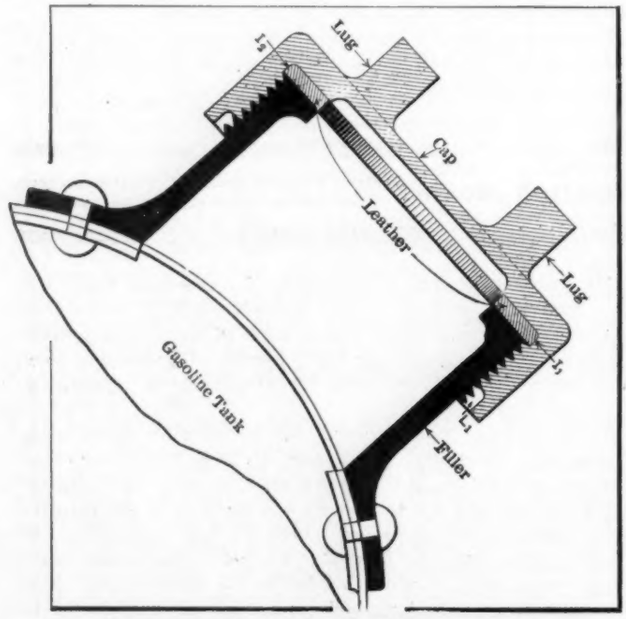


Fig. 1—Type of filler cap that will hold pressure

Profuse Lubrication Leads to Carbon Deposits

Editor THE AUTOMOBILE:

[2,535]—I am having trouble with my motor due to the formation of carbon, which I attribute to an excess of lubricating oil, and I am in hopes that I will be able to minimize this trouble by placing a baffle partition between the flywheel and the crankcase and utilize some kind of an oil pump for the purpose of maintaining the oil at a constant level in the lower half of the case. H. F. STRATTAN.

Clarion, Pa.

It occurs to the editor that there are so many of these cars in actual operation and considering the good satisfaction they seem to render you must be disregarding some of the conditions of operation that account for your form of trouble. It is a considerable undertaking to apply a pump as you suggest; a means of driving will be hard to arrange, and depending upon a belt-driven four-speed pump with your crankshaft at stake, sounds perilous. Try measuring your lubricating oil, fixing the time of replenishing the same with some precision, and see if you cannot obtain a more satisfactory result.

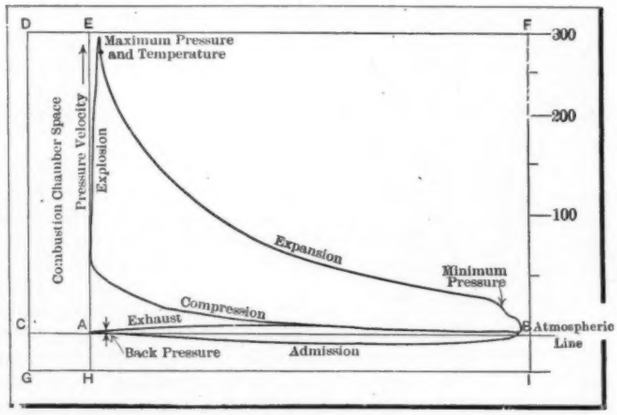


Fig. 2—Showing a conventional form of manograph card so made as to explain the relations

What Other Subscribers Have to Say

DISCUSSED

The Editor invites owners and drivers of automobiles who are subscribers to THE AUTOMOBILE to communicate their personal experiences for publication in these columns for the worthy purpose of aiding brother automobilists who may be in need of just the information that this process will afford. Communications should be brief, on one side of the paper only, and clearly put, including a rough sketch when it is possible to do so, and the name and address of the writer should be given as evidence of good faith, adding a nom de plume if the writer desires to withhold his name from publication.

Keep the Gasoline in Original Sealed Packages

Editor THE AUTOMOBILE:

[2,536]—I wish to instal la gasoline tank, but if the gasoline would be just as good without it, I would prefer not buying one. I have an outside cellar with double doors and covered on three sides with earth. Would that be a satisfactory place to store gasoline, and would the gas give the same power to the car? I care nothing about the fire risk, as it is located 500 feet from any building. Can you tell me the capacity of a tank 2 1-2 feet long and 22 inches wide, made of 1-4-inch steel?

Westtown, N. Y. J. W. EATON.

The capacity of the tank is about 34 gallons. This being less than the capacity of a barrel, it offers no very great attraction because you cannot buy gasoline in barrel lots, and you will have to pay the package price. It would really be worth while to install a gasoline storage tank since it would permit you to buy the gasoline at the lowest market price for barrel lots, and the gasoline would keep without deteriorating, which would not be the case with your present system.

Company Can Doubtless Tell You

Editor THE AUTOMOBILE:

[2,537]—Will you kindly tell me through your letter department what an E-M-F motor is geared on its first, second and reverse speeds? A SUBSCRIBER.

Johnstown, Pa.

Bleeder Would Be Too Small

Editor THE AUTOMOBILE:

[2,538]—I have a car with a 2-cylinder air-cooled motor, 3 1-2 bore x 3 1-4 stroke, which heats so badly that it burns up an exhaust valve every little while. Please advise me if the following plan would be feasible, and if it would correct the trouble: My idea is to tap a hole in the upper surface of each cylinder, just at the end of the down stroke of the piston, and fit a 1-4-inch iron pipe therein, leading to the muffler, the idea being to carry off some of the exhaust, thereby relieving the exhaust valve. Please give me your opinion of this procedure, and if not feasible, suggest something else.

R. D. BROWN.

Mobile, Ala.

The idea of a supplementary valve at the bottom of the stroke of an air-cooled motor has the requisite amount of merit to support it, but a little "bleeder" as a substitute for a valve would in all likelihood scarcely suffice for a practical purpose. One way to reduce the trouble that you are experiencing is to so time the valves that the exhaust valve will be open from, say, 10 degrees past center to, say, 40 degrees past center, at all events as long as possible. The inlet valve should be slightly reduced in the time of its opening, if anything, and the next plan lies in the use of a good magneto for the spark, so that the gas will be ignited and burned before the piston starts on the down stroke. It is important to avoid running on a retarded spark, to avoid valve heating.

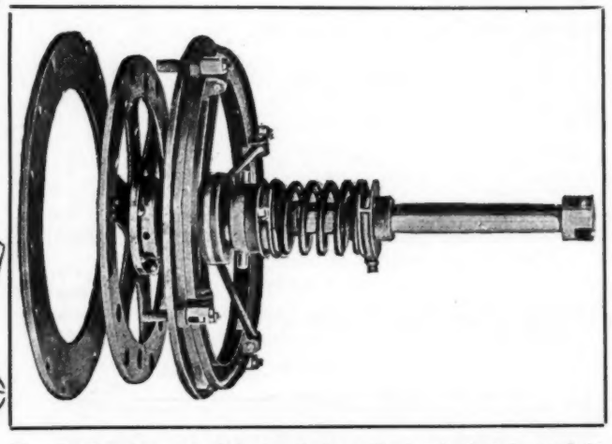


Fig. 3—Showing a 3-plate "cork insert" clutch that is used to transmit over 50 horsepower

Apparently It Is a Polish That Is Wanted

Editor THE AUTOMOBILE:

[2,539]—I am a subscriber to your magazine. I write to ask if you could give me some information about cleaning the windows on a touring car. I own a car with a touring body, the windows of which are made of mica, and as yet I have not found anything that makes a satisfactory cleaner, and therefore write to you for this information. Any advice you can give me on this will be much appreciated.

Braddock, Pa. J. G. KELLY.

Remembering that ground glass is not transparent, but that it may be made so by giving its surfaces a high polish, it remains to apply the same idea to the mica panes in order to render them serviceable again. Just how you will be able to accomplish this result is not plain. Perhaps some automobilist who may have successfully coped with the problem will cast a little light for the edification of those who are in need of the same.

New Contest Rules Were Published Last Week

Editor THE AUTOMOBILE:

[2,540]—Kindly answer the following questions in your next issue of THE AUTOMOBILE.

1. What are the requirements to live up to in an endurance run? Also explain fully the way it is started, etc.

2. What are the requirements in a race? Explain fully the way they start and the way they are penalized.

Lopez, Pa. A. W. MURRAY.

A preliminary statement of the status of the new contest rules as they will obtain for 1911 was printed in THE AUTOMOBILE of Feb. 23. The rules, as revised and perfected under the supervision of the Contest Board, were published in full in the issue of March 2.

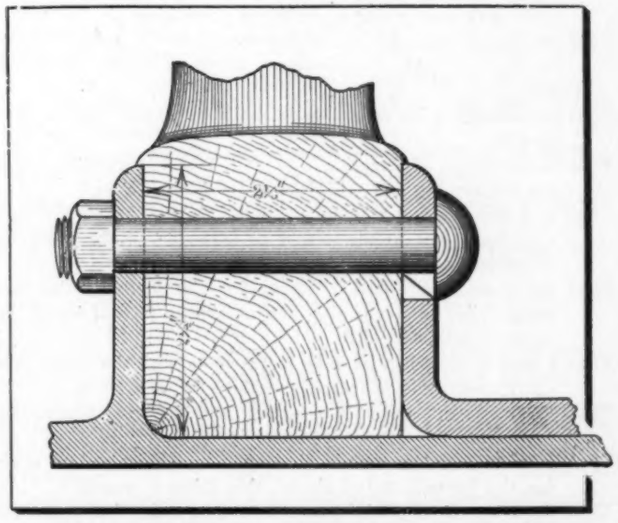


Fig. 4—Section through the mitre of the spoke, showing how the hub flange clamps the wood into a tight relation

It Stands to Reason

That Pleasure Is a Form of Profit and That Like Begets Like. A Good Automobile Put to Proper Use Is the Basis

That the best stallion that the army can take an interest in is in the form of a plant devoted to the manufacture of automobiles.

That it costs more money to replace horses during a military campaign than it does to equip an army with automobiles.

That the general staff of the army should have a capable automobile engineer in an authoritative position to tell it how to transport the men and the means.

That the general staff, as it is composed, is not fully fitted to make a wise selection of the means of transportation.

That the taxpayers of the country are sound asleep or they would not look with favor upon the proposal of the government to go into the horse-breeding business.

That the government official who does not know that a freight automobile will go 100 miles per day, where horses can only go 20 miles per day, is given too much authority if he is in a position to do any ordering.

That when the French crossed the Niemen, a century ago, with 127,121 horses, and came back within six months with less than sixteen hundred horses, it was sufficient proof of the fact that the French army was sadly in need of automobiles.

That $37,653,300 worth of horses that perished during the French campaign in Russia during a six months' campaign represented value that would purchase 7,531 of the best automobile transports that money can buy.

That 7,531 automobiles would transport 300,000 men covering a distance of 100 miles per day.

That Napoleon used up $37,653,300 worth of horses in six months in a campaign with half this number of men.

That experience is the great teacher; that progress is the great question, and that "antiquities" is the disorder that plays in the hands of the Japanese.

That the demand of the cavalry arm of the army at the present time is for 2,000 "mounts," and the army is on a peace footing.

That $600,000 expended per annum in replacements of horses would suffice to pay for 120 automobile transports per year with a carrying capacity of 5,000 men.

That ten squadrons of automobiles would be of greater worth in time of war than $600,000 worth of dead horses per year.

That there is food for reflection in these statements for the taxpayer.

That the mothers of America who will have to contribute sons for the coming war will do well to think it over.

That it is encouraging war to go on in the old and antiquated way, leaving it to the enemy to make all of the adequate preparations.

That the time is ripe for a reform of the methods that are being relied upon—if the men in charge do not know, let us have men who do!

That a man is old when he fails to progress with the times; age (as measured in years) has nothing to do with it.

That the men who think that horses are the best mounts for troops are as old as Methuselah.

That a horse for a mount is absolutely worthless unless grain for the horse is toted along; this takes a wagon.

That an army is as mobile as the wagon-train that totes the "grub" for the men and the forage for the animals.

That automobile transports are self-contained; they do not have to be attended by "feed-wagons"; the men would have their rations with them.

That the Standard Oil Company would gladly deliver all of the gasoline that might be required to any point free of delivery charges.

That instead of breeding horses it would be more to the point for the army to breed common sense.

That within a month after the opening of hostilities there will be an awful demand for freight automobiles.

That the officers who now decry freight automobiles will be willing to pay $10,000 apiece for "junkers," and they will be paying out the people's money.

That it will be cheaper for the taxpayer to go down in his commodious maw right now.

That if the army breeds horses the horses will breed disease, and disease will breed death to the troopers—automobiles is the right answer.

That embalmed beef and dead horses are more to be feared than the enemy's missiles.

That there is no greater enemy of the republic than the men who throw advantage to the four winds and wait the signal from our honorable competitor.

That an agitation for freight automobiles now will reduce the "agitation" of the republic when the war is upon us.

Tampering with the Carbureter

Unless He Has a Fair Knowledge of the Working, the Motorist Should Let It Alone

THE automobilist who does not understand his carbureter should let it alone till he has a fair knowledge of its working. It is very easy to spoil a good adjustment by random tinkering, and much less easy to restore.

Nevertheless it is certain that, some time or other, every owner will be thankful to know as much as possible about his carbureter. At best the carbureter is a somewhat delicate device, and cannot be otherwise from the fact that the forces acting on it are only those of the engine suction. Some time or other—it may be next month or next year—some trivial thing will go wrong. If the owner understands his carbureter he will trace and correct the trouble in a few minutes. If he does not, he will waste hours hunting for it, or pay the too-willing garage man to help him make a mountain of a mole-hill.

It is common prudence, therefore, for the reader to take the first opportunity to learn all about carbureters in general, and his own in particular. He should know what the spray nozzle, float and auxiliary air valve are; how they work and how to get at them; how to drain off sediment, clean the strainer and disconnect the gasoline pipe; what the several adjustments are, and what results may be expected if they are changed; what changes are likely to be required by variations in weather, altitude and fuel; and, finally, what the symptoms and the treatment are of the commoner derangements to float, gasoline supply and air valve.

Questions That Arise

Some of Those That Come Up in Every-Day Automobiling Are Answered by the Matter Presented by Forrest R. Jones in the New Edition of the "Automobile Catechism"

[403]—Describe some of the principal types of high-tension magnetos.

In one type the armature is of the ordinary shuttle form with a single coil wound on it. A transformer coil lies in the space between the armature and the crown of the magnets. The high-tension terminal of the transformer is connected to the arm of a high-tension distributer from whose contact points wires lead out to the jump-spark plugs. The low-tension circuit includes an interrupter which breaks the circuit so as to interrupt the armature current when ignition is to occur. A condenser is also included in the magneto. It is generally located alongside the transformer in the space between the armature and the crown of the magnets. The distributer arm is driven by a pair of spur-gears, one on the armature spindle and the other fastened to the distributer arm or the parts which carry it. The method of operation is the same as that of a low-tension magneto with an interrupter and a separate transformer.

In another type the armature hase two windings, a low-tension winding next the core, and a high-tension winding on top of the low-tension one. The condenser is generally also placed in the armature at one end. The low-tension electricity generated in the primary winding of the armature is transformed to high-tension in the secondary. The armature, therefore, acts as the transformer as well as the generator. An interrupter breaks the low-tension circuit at the instant for ignition. The high-tension terminal of the armature is connected to the arm of a high-tension distributer from whose contact points wires lead to the spark-plugs. The distributer arm is driven, in the usual manner by a pair of spur-gears. In a later form of double-wound magneto the length (axis) of the armature is parallel to the legs of the magnet, and the armature shaft pierces the crown of the magnet.

A third type operates on the condenser charge and discharge principle. It differs from the above two types chiefly in having two interrupters instead of one. More properly, one is an interrupter and the other a circuit-closer. The armature is of the shuttle type with only one winding. A transformer and a condenser are provided and usually located between the armature and crown of the magnets. The condenser is first charged by current from the primary winding of the armature and the primary circuit then broken by the interrupter, thus leaving the condenser charged. The circuit-closer then closes a circuit which includes the primary of the transformer, so that the condenser discharges through the low-tension winding of the transformer, thus inducing high-tension in the secondary of the transformer. The high-tension terminal of the secondary winding is connected to a distributer which directs the current to the different spark-plugs as desired.

[404]—Is the "battery floated on the line" system suitable for both high-tension and low-tension ignition?

Yes. Even if the low-tension system is such as to require a large amount of electricity the generator is capable of supplying it.

[405]—Is a battery alone suitable for a contact-arc (make-and-break) ignition system?

Only in case the current flows through the contact points of the igniter during but a very short time for each ignition. Otherwise the amount of electricity used will be so great as to rapidly exhaust the battery.

[406]—From what sources is acetylene gas obtained for headlights?

Either from a gas generator or from a tank containing compressed gas.

[407]—How is acetylene gas generated on the car?

By allowing water to come gradually into contact with calcium carbide in a tightly closed vessel called the generator. The water and carbide combine chemically so that acetylene gas is formed. A grayish-white ash is also produced.

The generation of gas produces a pressure in the tank sufficient to force the gas through tubing or pipes to the lamp burners (tips) and out through small openings in them.

The gas carries small particles of solid matter with it as it leaves the generator and must be passed through a filter for cleaning, since the particles would otherwise clog the burners. A piece of fine sponge answers well as a filter.

[408]—In what form is calcium carbide used in a gas generator?

Generally in the form of lumps, the largest of which will pass through a hole somewhat larger than one-half inch in diameter. Sticks or bars molded from pulverized calcium carbide and a matrix for cementing the powdered carbide together.

[409]—How is the rate of gas generation regulated to the proper quantity for the lamps?

By regulating the rate at which water is allowed to come into contact with the carbide. Some generators are made so that the pressure of the gas automatically regulates the flow of water. When the gas pressure increases it reduces the flow of water and as the gas pressure falls in consequence, the rate of water flow again increases, and so on.

In Prolonging the Life of the Car

There Are Duties to Perform That Must Not Be Neglected by the Wide-Awake Automobilist

If wear is to be aborted, foreign substances must not be entertained; noise is the logical sequence.

If foreign substances are to be barred, oil is the only agent that can be relied upon to properly police the bearings.

If the policeman who is sent on the beat is a grafter, he will have trucklings with the impure.

If law and order are to be enforced, it remains to accomplish the undertaking on a basis of intelligence.

If lubricating oil is to be the officer of the day, he must not have a jar of acid in his hip pocket.

If the policeman is incapable of arresting the foreign substances he is useless for the intended purpose.

If the policeman cannot withstand (political) pressure the end will be disorder—the beat will be scored.

If the police force is inadequate for the work, it is necessary to reform the department or the forces for disorder will soon have the upper hand.

If the man in charge of the police force is not agile and alert, it is useless to expect that the automobile will survive the year.

If there is any one function that is of the greatest importance in the running of an automobile, it is the performance of the lubricating oil.

Influence of the Multi-point Ignition

Otto Heins, Lecturing Before the Society of Autombile Engineers, Presents Ample Evidence of the Efficaciousness of the Multi-point Spark

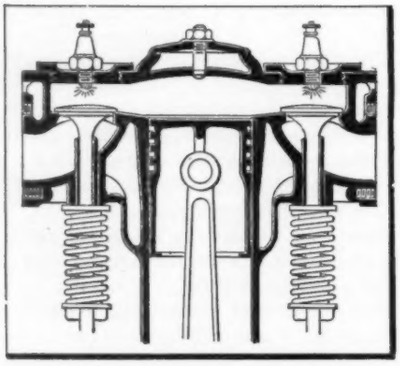


Fig. 1—Section of the T-headed motor that was used at the time of making the test, showing the location of the spark-plugs, one on each side, over the valves

A GIVEN engine supplied with a given volume of uniform mixture will deliver its maximum output if ignition and combustion occur when the combustion space is of minimum volume, but up to the present this condition has been impossible to realize.

The time required for the propagation of the flame throughout the mixture has made it necessary to cause ignition before the piston reached the dead center. This entails a loss of efficiency, because, in the first place, the combustion space is not of minimum volume when pressure is produced; and, in the second place, because of the heat loss that will result from the long contact of the burning charge with an unnecessarily large cylinder wall surface. Further loss of efficiency may be traced to secondary effects, such as thrusts due to the unfavorable angle of the connecting-rod, the less homogeneous quality of the mixture, etc.

The efficiency and output of an engine will increase directly with the reduction in the time required for flame propagation, and the conditions influencing this are of interest to the engine manufacturer.

It is obvious that if ignition occurs simultaneously at two or more points properly located in the combustion space, the time required for the complete inflammation of the mixture will be reduced. As an every-day example of the application of this principle, it will be understood that if a sheet of paper is ignited at one corner the flame will have but one direction in which to spread, and combustion will proceed slowly. If the sheet is set on fire at the center, the flame may spread in all directions, and combustion will proceed somewhat faster.

The advantage of two-point ignition has been thoroughly admitted theoretically, but practically the development of the idea has been hampered by difficulties in producing absolutely simultaneous sparks. A magneto has recently been introduced which solves the problem. As a result of the use of this instrument, ignition is produced simultaneously at two points in each cylinder, with the result that the time interval between the instant of ignition and the completion of combustion is very greatly reduced.

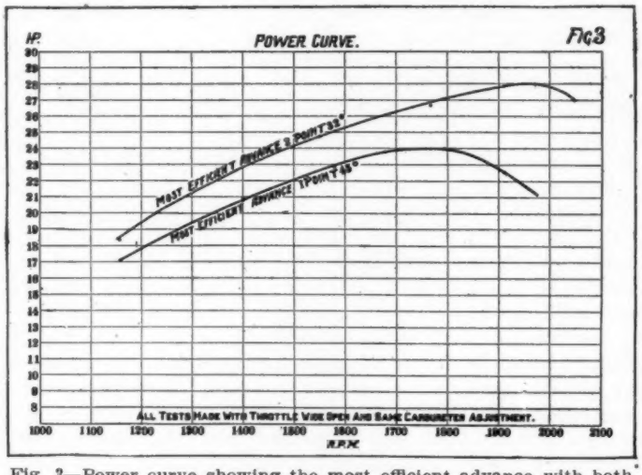

HP.
POWER CURVE.
FIG3
MOST EFFICIENT ADVANCE 2 POINT 33°
MOST EFFICIENT ADVANCE 1 POINT 48°
ALL TESTS MADE WITH THROTTLE WIDE OPEN AND SAME CARBURETER ADJUSTMENT.
R.P.M.

Fig. 3—Power curve showing the most efficient advance with both two and one point of ignition

Before proceeding with further explanations, however, it must be emphasized that the success of the system is dependent very largely upon the location of the spark plugs. If the spark plugs are placed in close proximity, as, for example, one vertically in

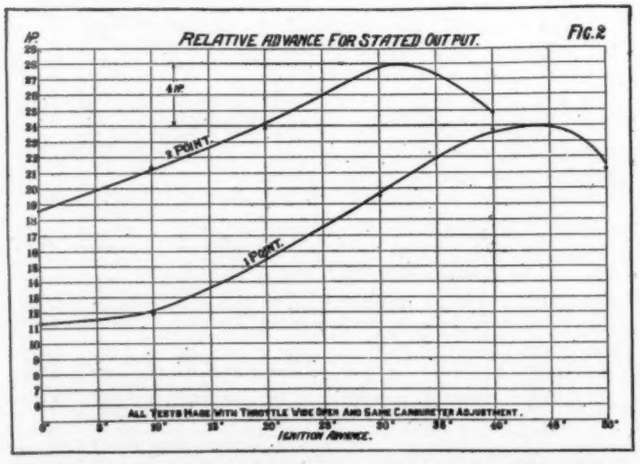


Fig. 2—Chart showing the horsepower output under different conditions of spark advance with both one and two points of ignition

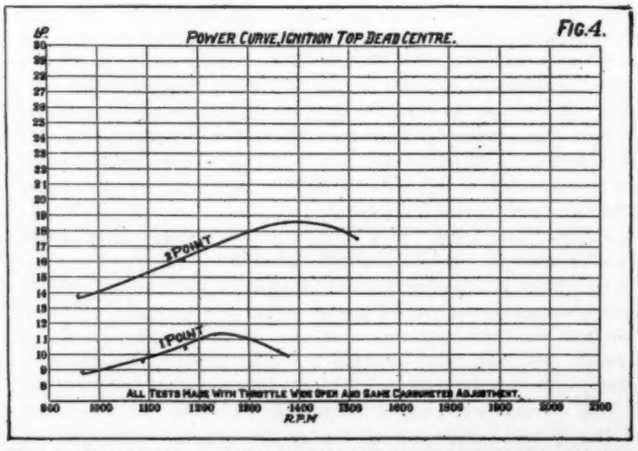


Fig. 4—Showing the result when the sparks were induced with the piston on the dwell point

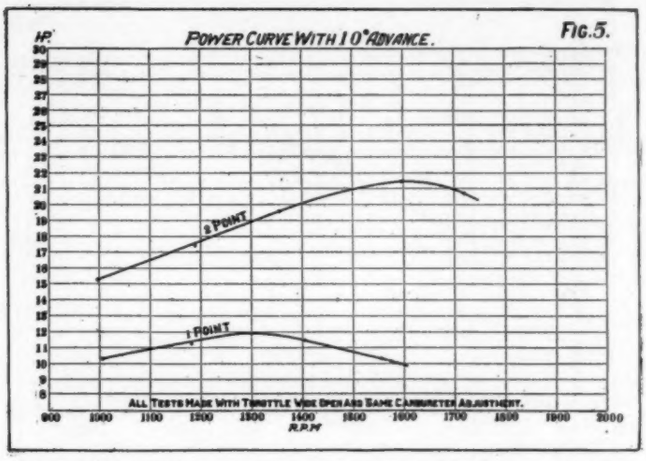


Fig. 5—Showing the power when the spark was advanced 10 degrees with two and one spark respectively

an inlet valve cap, and the other horizontally in the side of the same pocket, there will be no noticeable difference whether ignition occurs at both spark plugs or at one, for in either case the flame must spread from one side of the combustion space to the other.

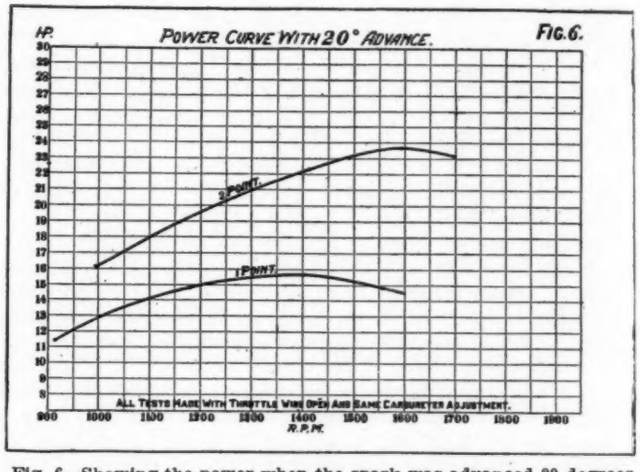


Fig. 6—Showing the power when the spark was advanced 20 degrees with two and one spark respectively

If the spark plugs are located at widely separated points, as will be the case with one plug located in the inlet valve cap and one in the exhaust valve cap, then the distance through which each of the two flames must travel will be very considerably reduced.

Fig. 1 illustrates the cross-section of a "T"-head cylinder of standard design, and it will be noted that the spark plugs in this are located in the valve caps. It can be seen that the distance through which the flame must travel, if it originates at the two points simultaneously, will be much less than the distance to be traveled should ignition occur at but one point. The object of multi-point ignition is to reduce the time required for flame propagation as much as possible, and in this diagram it will be seen that there is a much greater volume of charge contained in the space between the two spark plugs than there is in the space between the individual spark plugs and the walls of their valve pockets. In other words, when ignition occurs at a plug, the flame will spread throughout the mixture in all directions, but a longer time will be required for the propagation of the flame from the plugs to the center of the combustion space than will be necessary in other directions.

A better arrangement of the plugs will be such as to require practically the same time for the spread of the flame from the ignition point through the charge in all directions.

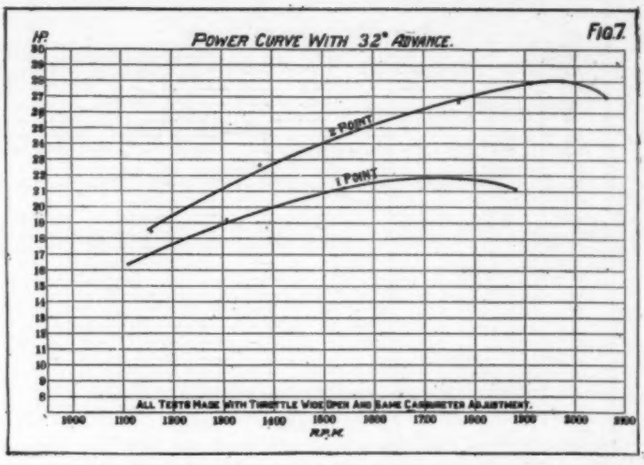


Fig. 7—Showing the power when the spark was advanced 32 degrees with two and one spark respectively

Furthermore, the sparks must occur at exactly the same instant, for the slightest difference in the occurrence of the sparks will reduce the advantage of the system. For this reason it is essential to arrange a single source of current with a single circuit-breaker, for this is the only way to prevent the inaccuracies that will be the result of the wearing of the parts.

A series of tests has been made on a four-cylinder "T"-head engine, built by the Chester Engineering Company, mounted on the dynamometer of the Automobile Club of America, that illustrates the above facts.

The engine is 3 9-16-inch bore by 4 3-4-inch stroke, and is fitted with a two-point Bosch magneto controlled by a switch that permits ignition by either of the two series of plugs or by both. This gives a ready means of comparing the power output of single-point ignition with that of two-point.

Fig. 2 is a compilation of these results.

The greatest power output with single-point ignition with an

OBSERVATIONS OF TESTS WITH SINGLE AND TWO-POINT IGNITION

Penn Motor Size 3 9-16" x 4 3-4"

Actual counter	Actual R.P.M.	Torque lbs.	B.HP.
	0° One Spark		
24,350			
23,867	966	16.2	8.92
22,312	1,174	15.4	10.3
21,085	1,227	16.2	11.3
19,725	1,360	13.2	10.2
	0° Two Sparks		
18,765	960	25.2	13.9
17,597	1,168	24.2	16.1
16,911	1.372	23.8	18.6
16,152	1,518	20.3	17.6
	10° One Spark		
15,648	1,008	17.9	10.3
15,058	1,180	16.7	11.2
13,649	1,409	14.2	11.4
12,866	1,566	11.4	10.2
12,216	1,300	15.9	11.8
	10° Two Sparks		
11,718	996	26.7	15.2
11,124	1,188	25.7	17.4
11,594	1,364	25.1	19.5
10,795	1,598	23.4	21.3
	20° One Spark		
9,883	912	22	11.4
9,294	1,178	22	14.8
8,593	1,402	19.4	15.7
7,814	1,558	16.8	14.9
	20° Two Sparks		
6,821	993	28.5	16.2
6,240	1,162	28.6	19
5,533	1,414	27.7	22.3
4,737	1,592	26.1	23.7
3,890	1,694	24	23.2
	32° One Spark		
53,422	1,114	25.9	16.4
52,767	1,310	25.7	19.2
51,995	1,544	24.1	21.2
51,108	1,774	21	21.8
50,167	1,882	19.6	21.1

Actual counter	Actual R.P.M.	Torque lbs.	B.HP.
	32° Two Sparks		
59,877			
59,190	1,374	29	22.7
58,415	1,550	28	24.8
57,531	1,768	26.5	26.7
56,575	1,912	25.5	27.8
55,589	1,972	24.9	28 *
54,561	2,056	23	27
53,979	1,164	27.7	18.4
	35° One Spark		
39,399			
38,764	1,270	26	18.8
38,030	1,468	24.8	20.8
37,192	1,676	23	22
36,251	1,882	19.5	20.9
	35° Two Sparks		
46,103			
45,511	1,184	27.9	18.8
44,182	1,329	27.4	20.8
43,367	1,630	26.4	24.5
42,443	1,848	26	27.3
41,445	1,996	23.8	27
39,399	2,092	22.6	26.9
	40° One Spark		
51,108			
50,000	1,108	25.3	16
48,723	1,277	25.5	18.6
47,949	1,548	25	22.1
47,058	1,732	23.5	23.8
46,103	1,910	21.2	23.1
	45° One Spark		
64,639			
64,058	1,162	25.8	17.1
63,358	1,400	26.2	20.9
62,569	1,578	25.5	22.9
61,731	1,676	25	23.8
60,835	1,792	23.5	24 †
59,877	1,916	20.8	22.7
	50° One Spark		
	1,904	18.6	20.3
	40° Two Sparks		
	2,030	21.5	24.9

Length of dynamometer arm, 3 feet, torque constant, .00057.

*Maximum output with 2-point ignition.
†Minimum output with 1-point ignition.

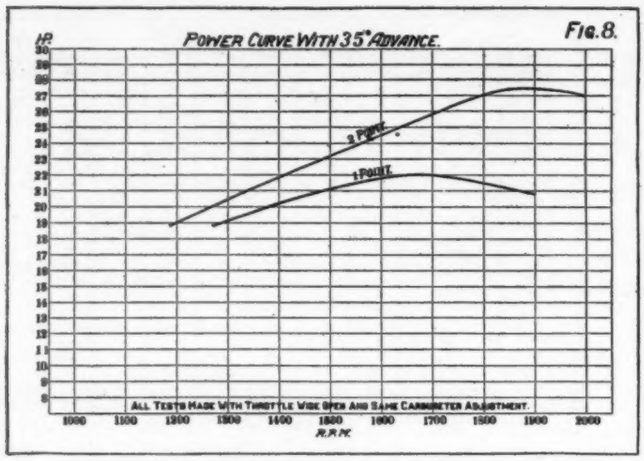


Fig. 8—Showing the power when the spark was advanced 35 degrees with two and one spark respectively

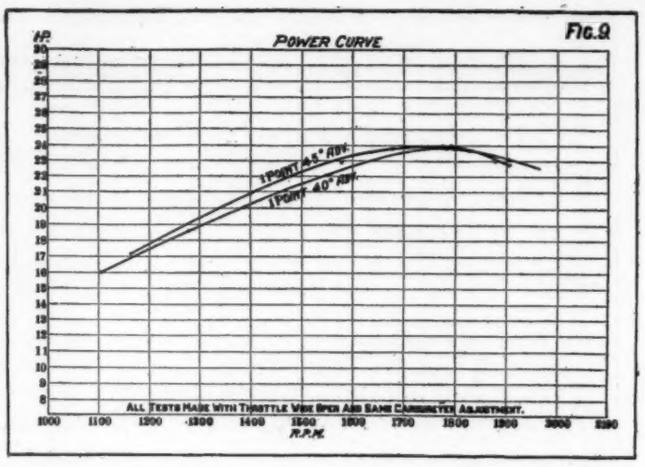


Fig. 9—Showing the power when the spark was advanced 40 and 45 degrees, using only one point of ignition

advance of 45 degrees is 24 horsepower and the same output was attained with two-point ignition with an advance of but 19 degrees. With two-point ignition the extreme power output with an advance of 32 degrees was 28 horsepower. This is an increase of 4 horsepower or 16.6 per cent. over the best results with single-point ignition.

Fig. 3 is a comparison of the power outputs with one-point and two-point ignition respectively, each being set at the most advantageous point of advance. It will be seen from these figures that the use of a properly installed two-point ignition system will result in a great reduction of the necessary lead, and consequently in a corresponding increase in efficiency and power output.

It will be observed from the curve that the number of revolutions at which stated power will be produced with two-point ignition is very considerably below the number of revolutions at which single-point ignition will produce the same power.

This indicates a corresponding saving in the consumption of fuel, and experience shows this assumption to be correct.

The development of multi-point ignition will undoubtedly result in a still greater advantage.

Figs. 4, 5, 6, 7, 8 and 9 show the power developed by one-point and two-point ignition at various degrees of advance, and are the curves on which Fig. 2 is based.

Where the utmost power is not required, and where it is an advantage to simplify the construction and control as much as possible, as is the case with pleasure and utility cars, the magneto should be given a moderate advance to produce approximately the same output as single-point ignition at the most favorable advance. This will permit fixed ignition to be used, and, in addition to the resulting simplification, it will insure the complete combustion of the charge under any condition. By using a switch permitting ignition on one series of plugs or on both, the effect of retarding is obtained by employing but one series for starting and slow running, while both series may be used for operation at speed.

For commercial cars the use of fixed ignition of this character with a moderate advance will insure maximum economy and will protect the engine in a great measure from injury through the unskillful use of the controls.

In cases where the maximum output must be attained, as is required on racing engines for automobile, marine and aeronautic purposes, the most favorable advance should be selected (approximately 30 degrees) and hand control provided.

Aside from increasing the output, the system has the advantage of greatly reducing the ill effects of a defective spark plug or cable; inasmuch as the two plugs are in series with the armature, it follows that the failure of one of them will not interfere with the operation of the other.

In construction the two-point magneto is identical in every respect with the standard instrument, with the single exception that a second distributer is provided to serve the additional set of spark plugs. To this distributer is led that end of the armature winding which in the standard magneto is grounded. The timing is controlled by the single interrupter which is standard in every respect.

To Remedy Sticking Valves

Which When Hot Frequently Offer Resistance in Excess of the Ability of the Springs

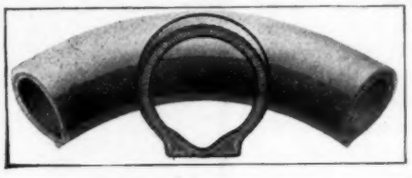
WHEN motors perform badly, and credit is given the valves for being mechanically in good order, the trouble is frequently blamed on the ignition system or the timing. In divers of these instances, it was ascertained that the valves stuck when they became hot, and the resistance offered was in excess of the ability of the springs. It is not a real remedy to attach stouter springs, and there are disadvantages in so proceeding. The stouter the springs the greater will be the wear on the cam, roller, lift and the end of the valve stem. If a soft pad is used in the head of the adjusting member it will be pulverized if the spring is too strong; or in the absence of a buffer such as this the end of the valve stem will broom out. The trouble is due to the curling up of the stem because a means is not afforded for transmitting the heat away from the mushroom, down through the length of the stem, and off to the waterjacket, in the manner as before stated.

A very liberal fillet at the junction of the valve stem with the mushroom not only prevents the curling up of the stem by equalizing the temperature throughout, but it also prevents the mushroom from tilting out of its position at right angles to the plane of the stem. There are two reasons apparently for placing a fillet of liberal proportions at the junction, one of which is to impart mechanical rigidity to the mushroom, and its joint with the stem; the other reason is bound up in the greater mass of metal which is available for the transfer of heat. If the maker of an automobile fails to observe these well-understood conditions, the repair man, if he appreciates the true situation, is offered a wonderful opportunity to deliver a satisfactory repair and materially improve the actual working qualities.

When the car comes home, if it is be-smeared with mud, it is like contracting for a painter not to wash it.

Tire Makers Tell of Growth

The Letter, as Here Reproduced, Was Mailed to Each Maker of Tires, Bringing Responses as Printed Below



Section of Goodrich tire

FOR the express purpose of telling the users of automobiles something of the growth of the automobile business, it is proposed to publish such statistics about tires as can be gathered from the leading makers in all sections of the country.

The tire industry is a large one; it represents much in the measuring of the prosperity of the country as it has been fostered by the coming of the automobile, and it would be of value to publish a few of the more important facts, provided they could be had from you. Please answer the questions as here propounded, for exclusive use in THE AUTOMOBILE, adding such other information as you may care to compile; and with your contribution please furnish photographs of your latest and most valued product, so that the article may be accompanied by actual evidences such as the occasion would suggest.

(A) When did tire making begin in your plant?

(B) What was the value of the output year by year from the beginning to the present time?

(C) How much floor space do you occupy in your plant at the present time, and what was the floor space from year to year as the plant expanded?

(D) How many persons do you give employment to at the present time, and how did the force expand from year to year from the start?

(E) What is the proportion of women who are engaged in the work of making tires?

(F) What is the weekly pay-roll at the present time, and how did this pay-roll increase from year to year?

(G) What is the proportion, by weight, of rubber in tires?

(H) What is the proportion, by weight, of cotton fabric in tires?

(I) What is the number of tires that are used per year per automobile in actual service, according to your experience?

(J) What is the best tire-size to employ relative to weight and speed as expressed in a tabulation of sizes?

(K) What is the effect of speed, rather than weight, on tire-life?

(L) What is the effect of weight, rather than speed, on tire life?

(M) What is the greatest abuse to which tires are being subjected at the present time?

(N) What is the immediate prospect for some great improvement in tires?

(O) What is the future possibility from the tire-makers' point of view?

(P) What is the effect of carbonic acid on tires?

(Q) What is the effect of products of combustion from the motor cylinder upon tire life?

(R) What is the value of gauges to automobilists in the inflation of tires?

(S) What is the effect of grease on floors on tire life?

(T) What is the effect of mud and water on tires, and how do they last relative to dry-weather work?

(U) What is the effect of heat and cold on tire life?

(V) What is the effect of speeding around curves on tire life?

(W) What is the extent of rim-cutting, and why?

(X) What is the greatest difficulty with tires?

(Y) What is the greatest advantage of tires?

(Z) What other question do you consider worthy of discussion now?

Editor THE AUTOMOBILE.

Goodrich Imparts Version of Tire Making —Women Not Employed

Editor THE AUTOMOBILE:

We are pleased to answer a number of the questions contained in your circular letter of February 17 and with this contribution, we are sending photographs of several tires that may well accompany the article:

(A) The Goodrich Company first made pneumatic tires for bicycles nearly twenty years ago and pneumatic tires for automobiles about twelve years ago.

(B) We are not in a position to give you an exact answer to this question. It is a noteworthy fact that the value of the Goodrich output has more than quadrupled the automobile output within four years.

(C) Amount of floor space occupied, 32 acres. Largest increases have been shown within the past five or six years, in which time the Goodrich Company has actually trebled its size and the value of its output.

(D) Number of persons employed, 5,000.

(E) No women are employed in the work of making automobile tires. It is the sort of labor that demands man's work in all its branches in order to get the proper efficiency.

(F) Unable to answer.

(G) Broadly speaking, the proportion by weight of rubber in tires is 75 per cent.

(H) The proportion by weight of cotton fabric in tires is 25 per cent.

(I) This is rather a difficult question for us to answer. A series of letters recently collected from a large number of Goodrich tire users show that they average but one set of tires per year, or, to put it better, per riding season, which seems to be the time specified in most of the letters.

(J) 34 x 4.

(K) Excessive speed undoubtedly destroys more tires than excessive weight, that is, we believe that continuous high speed is more of a detriment to tire life than large weights carried at a very slow speed.

(L) Answered above.

(M) Lack of proper inflation.

(N) Goodrich 1911 tires.

(O) Steady development of Goodrich tire construction.

(P) None to our knowledge.

(Q) None other than where oil comes in contact with the tire.

(R) Invaluable and should be more extensively used.

(S) Bound to rot the tire.

(T) Mud and water have little bad effect. Tires last better in a moist atmosphere than they do in a dry one. Extremes of heat or cold are both bad on tire life. Heat tends to soften

the rubber and cold to harden it to a possible point of brittleness. This, of course, is speaking of extreme degree of temperature either way.

(U) Nothing more detrimental to tire life. Terrific strains are brought against the sides of the tires to the point of breaking the carcass and the ultimate ruin of the whole construction.

(W) Growing less and less, and no longer a factor of much consideration.

(X) Carcass breaking.

(Y) Makes the automobile possible.

(Z) Don't know.

THE B. F. GOODRICH CO.

S. C. Tibbetts

Advertising Manager.

Firestone Opinions Are Terse and Sharp

Editor THE AUTOMOBILE:

Replying to your circular letter of February 17, the replies we can give you are as follows:

(A) 1902 present, 1900 elsewhere.

(B) Small first year, eight or nine million present year.

(C) Now about 14 acres—then about 1,000 square feet.

(D) Now about 1,200.

(E) About 2 per cent.

(J)

Size of tire, inches	Weight per wheel, pounds	Air pressure recommended
28 to 36 x 2 1-2	225	40
28 to 36 x 3	350	50
28 x 3 1-2	400	60
30 x 3 1-2	450	60
32 x 3 1-2	550	60
34 and 36 x 3 1-2	600	60
30 x 4	550	75
32 x 4	650	75
34 x 4	700	75
36 x 4	750	75
32 x 4 1-2	700	85
34 x 4 1-2	900	85
36 x 4 1-2	1000	85
36 x 5		90

(M) Under-inflation.

(O) Continually improved service from our tires.

(R) Valuable.

(S) Rots the rubber.

(U) Great heat injures tires.

(V) Damaging.

(W) Amounts to nothing because modern clincher tires are made better.

Yours very truly,

The Firestone Tire & Rubber Co.,

By Jno. F. Singleton

Advertising Manager.

Diamond Tire Company Says Question (N) Is Too Ambiguous to Be Answered

Editor THE AUTOMOBILE:

We began making automobile tires in 1898. As to the value of our output and some of the other questions you ask we have nothing to say for publication. We employ no women in the making of automobile tires, with the exception of a very few, possibly 1 per cent. of the total number employed in tire making, and they are engaged in a part of the process of making inner tubes. In our entire organization, which includes several lines of rubber goods in addition to tires, we employ slightly more than 5,000 people as against 250 people employed in 1898 and 1,700 employed in 1903.

Your questions G and H cannot be answered because constructions must vary in the building of tires, depending on size, type, etc. The best data we have would indicate that the average of tires used per automobile per season would be slightly less than 5 and extending over a period of, say, three years would be on the average of about 12 tires for that period, depending altogether on the extent to which the car was used. We refer to average service.

Shawmut tire

Your questions K and L: If a tire is properly inflated it suffers more from speed than from weight. If it is improperly inflated weight does more injury or as much as speed does. Lack of inflation and neglect of minor repairs required are the greatest abuse to which tires are subjected.

Your question N is too ambiguous to be answered intelligently. We think tires are being made better and better each year. No one can tell where improvements will end, but we have every reason to believe that the pneumatic rubber tire will be the equipment of pleasure automobiles twenty years from now. The use of carbonic acid on tires is harmful. We have no experience showing the effect of the exhaust gases of combustion from the cylinder as regards tire life. It is our best judgment that it would be harmful. Every automobile owner ought to have a reliable tire gauge and use it. The proper inflation is from 17 to 18 pounds per inch of tire cross section. Grease and oils are injurious to all rubber. Mud and water are not especially harmful except as they produce increased friction, and therefore increase wear, so long as water does not get inside the tire. In hot weather rubber will deteriorate more rapidly than in cooler atmospheres. Heat is injurious to rubber. The average cold weather is not especially injurious. Extreme cold is slightly so.

Your question V should be intelligently answered by any average man. Rim cutting is something that need not be feared as rims and tires are now made. It might happen that rims were so seriously imperfect as to cut the tire. If the tire is run for a long distance deflated it will be ruined from meshing, though it may not be rim cut. But if it is rim cut there is no guarantee for injuries sustained in such a manner. One might go so far as to say that the rim-cutting evil that existed a number of years ago has been done away with entirely by every reputable tire maker.

Your questions X and Y we do not understand sufficiently well to undertake to answer.

In answer to your inquiry Z, a question worthy of discussion might be, "How long will the automobile user believe it possible that any tire with a rubber tread, no matter what the tread's surface may be, can be made to prevent skidding? How long will he believe that all tires are more or less alike because they look more or less alike and that he is taking chances no matter what he buys—therefore he doesn't take pains to specify when ordering his car or when buying new equipment." In short, when will the automobile user undertake to buy automobile tire casings and tubes intelligently and to use them intelligently, getting away from imaginary benefits that, though they may look plausible and may cost him good money, are as worthless as if they were plainly labeled simply "humbug"?

Yours very truly,

THE DIAMOND RUBBER CO.

By H. C. Breeden

Don't look at the world through tires—colored glasses furnish a more pleasing perspective.

Don't place too much confidence on tires from the junk shop; there is many a slit that can be filled with chewing gum.

The Goodyear Tire

"People Are Beginning to Use Tires Intelligently" — Goodyear

Editor THE AUTOMOBILE:

We will reply to the various questions in your letter of Feb. 17 as follows:

(a) We began tire making in 1898.

(b) The value of our output in 1900 was $1,000,000. In 1910, $10,000,000.

(c) In 1898 we had 70,000 square feet of floor space. To-day we have 750,000 square feet.

(d) In 1899 we employed 100 people; 1902, 200; 1904, 400; 1908, 700; 1909, 1,200; 1910, 2,300; 1911, 3,000.

(e) About 8 per cent. of our employees are women.

(g) Approximately, 75 per cent. of the weight of the tire is rubber.

(h) 25 per cent. is cotton.

(i) The average machine probably uses about six tires per year.

(j) Most mileage will be obtained by using tires one-half inch larger in cross-section than size recommended in the usual tables.

(k) Speed creates heat in the tire. Has a tendency to soften the rubber and cause the plies of fabric to separate.

(l) The excessive weight tends to break down the walls of the tire.

(m) Insufficient inflation probably causes more tire trouble than anything else. This is especially true of clincher tires, due to rim-cutting. Overloading comes next.

(n) The most interesting condition in the tire industry now is the fact that people are beginning to realize the necessity of using their tires intelligently. This will do more to increase the life of tires than anything we can imagine in the way of improvements in construction.

(o) We do not look for any radical departure from present methods of construction. There will be gradual improvement from time to time and more satisfaction in tire service as users become more familiar with the proper methods of treatment of tires.

(p) Carbonic acid gas being more attenuated leaks through the rubber in the tube many times faster than air, with the result that tires are insufficiently inflated most of the time when this gas is depended on. If you would inflate your tires with carbonic acid gas you should inflate them at least once a day.

(r) Every motorist should have a tire gauge. We never knew anyone expert enough to guess anywhere near the actual inflation in a tire.

(s) Grease and oils rot rubber.

(t) If tires are in perfect condition water and mud have no effect on them unless the water should be permitted to get on the inside of the tire, where it will rot the fabric. If the treads are cut through the water will get into the fabric and rot it in this way.

(u) Effect of intense heat is explained in "k." Cold affects rubber only slightly, unless rubber should be placed under severe strain at the same time it is subjected to extreme cold. In general, it is safe to say that ordinary degrees of heat and cold do not materially affect tires unless there is an accompanying severe strain.

(v) Speeding around curves throws a terrific strain into the walls of the tire, and consequently shortens tire life.

(w) Rim-cutting is generally caused by insufficient inflation. There are a lot of tires that are insufficiently inflated, and where these are clincher tires they will be rim-cut. It is impossible to so injure properly made tires, on account of the construction of the bead and the rounding flange on which the tire rests on the rim.

(x) We have probably covered this question already in others.

(y) About the biggest advantage in the pneumatic tire is its resiliency, which adds materially to the life of the car.

Yours very truly,

THE GOODYEAR TIRE & RUBBER COMPANY.

Auto Tire Department.

Akron Tire Statistics

Chamber of Commerce Is Authority for Some Big Figures About the Tire Industry

AKRON, O., March 6—The Akron Chamber of Commerce has prepared a list of the eighteen rubber concerns of the city showing its importance in the amount of capital invested, time of organization and the number of people employed. The table is as follows:

Firm	Established	Capital	Employees
B. F. Goodrich Co.	1869	$20,000,000	5,000
The Diamond Rubber Co.	1894	10,000,000	4,500
Goodyear Tire and Rubber Co.	1898	4,000,000	1,700
Firestone Tire and Rubber Co.	1900	4,000,000	900
American Hard Rubber Co.	....	2,500,000	300
Swinehart Tire and Rubber Co.	1904	400,000	150
Buckeye Rubber Co.	1900	209,000	225
Miller Rubber Co.	1904	500,000	300
Alkali Rubber Co.	1904	1,000,000	350
Star Rubber Co.	1907	250,000	125
Royal Rubber Co.	1909	200,000	15
Stein Double Cushion Tire and Rubber Co.	1901	200,000	15
American Tire and Rubber Co.	1910	200,000	..
Standard Rubber Co.	1901	50,000	..
Motz Tire and Rubber Co.	1905	50,000	6
Lyon Rubber Co.	1904	15,000	15
Federal Waterproofing Co.	....	100,000	..
		$43,674,000	13,601

The Trend of Events

Points to the Further Refinement of the Automobile and to the Amelioration of the Conditions that React Against Its Efficient Use

Points to the double spark magneto as a means for getting more power out of a given size of motor and to the fact that the more vigorous explosion resulting may bring on bearing and other trouble—this will be true of the motors that have a weak constitution.

Points to more efficient radiators in order to avoid carbon accumulations in the combustion chamber space. It is being realized that over-heating of the motor results in the "cracking" of the gasoline, and it should be understood that the way to abort this trouble is to allow enough air to enter to feed a sufficient supply of oxygen to the fuel to save it from cracking.

Points to superior inflating equipment for the tires in order to save them from the ills of flexure. More damage is done in half an hour on tires that are not properly inflated than can be counted in 1,000 miles of normal service—power pumps are rapidly coming into use.

Points to better spark plugs. The magneto is handicapped by poor spark plug equipment. If the spark plug breaks down at 2,000 volts, the magneto must cease to generate above this point. The ability of a spark is measured by the energy that is set free in the gap.

Points to the use of better grades of steel than were employed in the earlier types of cars, with less talk about heat treatment as the cure-all.

Points to more care in the heating of the gasoline as it issues from the nozzle of the carbureter, so that the formation of carbon in the combustion chamber of the motor will be more nearly avoided.

Properties of Permanent Magnets

Discussing Some of the Points That Have to Do with the Service Expectation of Steel for This Purpose

IGNITION work, demanding the use of a magneto, is being refined as experience dictates, but there are quite a number of important details that will have to be cleared up ere it can be claimed by the users of magnetos that they will be safe from petty annoyances and kept free of unnecessary costs. Some of the points that would seem to require attention are so basic in character that they will have to be taken up between the makers of magnet steel and the manufacturers of magnetos. Magnetism, as it is manifest in a permanent magnet, may be a well understood phenomenon by some of the magneto makers, but it is not necessarily an open book to all. If it is well appreciated that the electromotive force induced in the inductors of a rotor is in direct proportion to the flux density in the air gap, it will also be understood that the flux density in the air gap is proportioned to the number of lines of force that emanate from the polar faces of the permanent magnets after leakage is deducted. But since it is difficult to handle this problem in this way, it is usual to say that the flux of the magnetomotive force is at a certain density per unit of area of the section of the magnet as 15,000 lines per square centimeter, or the equivalent per square inch, is a possible value, unless it is preferred to take advantage of the more approved nomenclature, when the same information would be imparted by saying: "The magnetic induction will be a certain number of *Gauss* per square centimeter of area of cross-section of the magnet," as, say, 15,000 Gauss.

Magnets May Be So Highly Saturated That They Will Not Remain Long in That State

When the inductors on the rotor cut the magnetic flux, as we may say, the induced electromotive force in volts will be more or less, depending upon (a) the magnetic induction, (b) the number and speed of the inductors on the rotor, (c) the area of the polar horn, or the total of magnetic flux, so that it is of the greatest importance to use permanent magnets of the character that will afford the maximum of the magnetic flux, but it will be wrong to use magnets that will not continue to live up to a given standard.

The difference between a permanent magnet and an electro-magnet lies in the fact that the permanent magnet is supposed to retain its magnetism after the magnetizing force is removed. The electro-magnet, on the other hand, demagnetizes the instant the magnetizing force is removed. The magnetizing force is measured in ampere-turns; that is to say, the number of turns of wire that is wound around the magnet is counted and the current that is set up in the coil is measured when turns of wire multiplied by current in amperes equals ampere-turns; this is the magnetomotive force.

In practice, it has been found that the more marked is the result of the application of the magnetomotive force, the less will be the permanence of the magnet. In other words, if a piece of iron is subjected to a magnetizing influence, if the iron is soft and pliable to the force, it will assume a higher value of the magnetic flux before it reaches the state known as "saturation." But this high value of the flux before saturation is a sure sign that the metal will be of no commercial value in a permanent magnet, due to the fact that the magnetism will not survive after the force is withdrawn.

In the selection of the iron that is to be used for permanent magnet work, it follows then that a compromise must be made between a high flux density and retentive qualities. It is useless to select metal that will deliver a high flux for a time. Magnetos, as they are used for ignition work, should be dependable.

What Are the Desired Properties of the Iron That Is to Be Used in Permanent Magnets?

It has been found that when the iron is as nearly pure as possible, it will respond to the magnetizing force to the greatest extent, but the magnetism will depart when the force is withdrawn.

Remembering this, it remains to state that if the iron cannot be used in the nearly pure state, due to the fact that it will not temper, steel is the proper metal to employ for permanent magnet work. The reason for this lies in the fact that steel will take on temper. The temper is necessary, due to the fact that magnetism takes up a permanent residence in the metal if it is tempered. What is it that is at the bottom of the retention of the magnetism in steel when it is tempered? May we not conclude that the magnetomotive force is permanently set up in the tempered metal, whereas in soft iron, the magnetomotive force is only imparted to the iron for the period when it is applied through the use of the magnetizing coil. Now, since a magnetizing force is measured in ampere-turns per unit of length (ampere turns per centimeter of length), it remains to be observed that the magnetomotive force of a permanent magnet is a certain measure per length of the magnet. This is an important detail; if the magnet is one unit in length (say one centimeter) the magnetomotive force will be of a certain value as reflected by that length. But if the length is doubled the magnetomotive force will be doubled also. In other words, the magnetomotive force of a permanent magnet is that of a unit of length multiplied by the units of length of the permanent magnet.

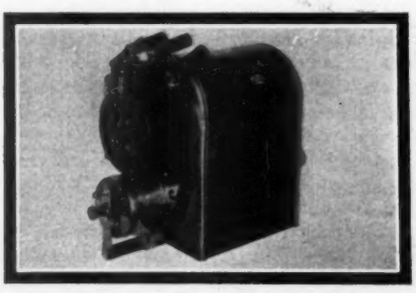


Fig. 1—Connecticut high-tension magneto with self-contained secondary coil

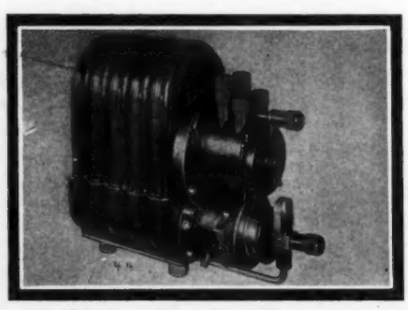


Fig. 2—Heinze high-tension magneto with round section permanent magnets

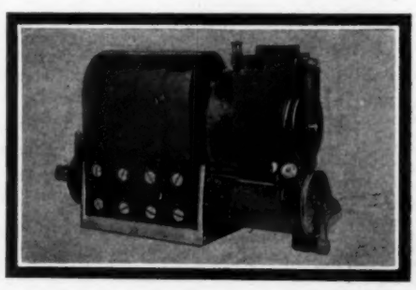


Fig. 3—U & H magneto of the true high-tension type for two-point ignition work

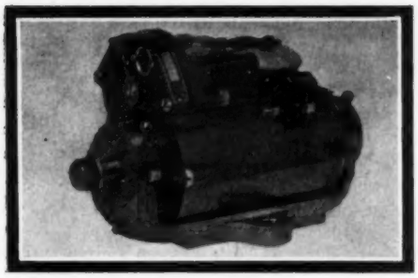


Fig. 4—Mea magneto with horizontally disposed permanent magnets of a shell-like shape

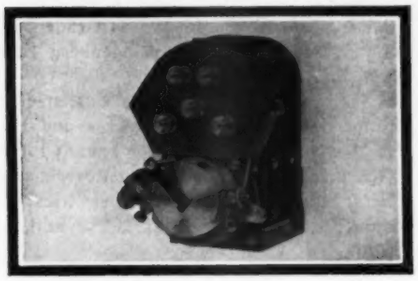


Fig. 5—Bosch D U-4 dual type of high-tension magneto utilizing a separate coil on the dash

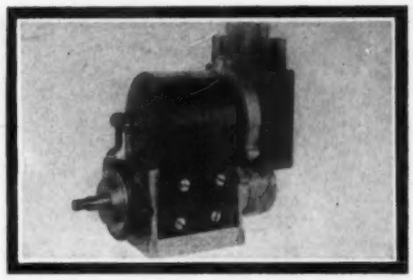


Fig. 6—J & B true high-tension magneto designed for 2-point ignition work

In building a magneto, under the circumstances, some skill must be displayed in the determination of the length of the magnets. But is this skill to be on a fixed basis? Will the length of the magnets be the same in all cases, taking no account of the characteristics of the material? We think not. The magnetomotive force is but one of the properties of the material. Since the magnetic "reluctance" is not the same in all the grades of the steel used for the purpose, the flux density (magnetic induction) will vary to a marked extent, according to the law, which may be expressed as follows:

When,

B = magnetic induction;
H = magnetizing force;
U = magnetic permeability;

$$U = \frac{B}{H}$$

$$B = U\,H$$

and,

$$H = \frac{F}{m}$$

F = the force as measured in dynes; and

m = strength of pole.

In the light of these expressions, remembering all of the relations, some of which are omitted since they would unduly complicate the situation, it remains to point out that while the magnetomotive force of a permanent magnet is dependent upon the length of the magnet, even so the reluctance of the magnet increases also with the length of the magnetic circuit, so that the possibility of making a magnet of such a length that the magnetic induction would be excessively reduced despite the high magnetomotive force, due to high magnectic reluctance, is a grave menace.

What Are the Properties That Are Mostly Desired in the Steel?

Shape—in other words, section—of a permanent magnet must be considered. This point must be taken account of in view of the qualities that may be imparted to the iron in the process of heat treatment. If it is admitted that the degree of hardness will depend upon the shape and condition of the metal as well as upon the composition, it remains for the maker of magnetos to find out what is the most efficacious shape or section, and conform to this requirement.

Granting that nearly pure iron makes the best electro-magnet, but that it cannot be used in permanent magnets due to the lack of retentivity, it remains to so fabricate the steel that it will hold as much as possible of the magnetic properties that are mostly desired, and have the added value of high retentivity. Carbon has been found to impart much of the desirable quality. Too much carbon is detrimental. If carbon steel is used, that is, steel that is as pure as possible, excepting that carbon is added to give it the tempering property, it is conceded that the carbon should not be under 60 points, nor has it been found that more than 80 points carbon should be present. Increasing carbon has the effect of making the magnet more retentive, but the flux density (magnetic induction) decreases, due, no doubt, to the higher magnetic reluctance of the material, and perhaps lower magnetomotive force.

It has been found that increasing carbon decreases the net result as a permanent magnet, and those who have struggled with the problem, taking this fact into account, have expressed the opinion that the retentivity of the magnet will be below the best requirement if the carbon is even as low as 60 points, and that the magnetic induction will be too low if the carbon is increased to 90 points. The next advance was in the direction of alloying, and, with tungsten, lowering carbon, it was possible to increase the retentivity without lowering the magnetic induction.

Points to Be Remembered in Taking Advantage of Alloy Steel for Magnets

Granting that tungsten steel is a superior material to use, considering the present state of the art, it remains to settle upon the chemical composition of the steel, and then discuss the effect of the several methods of fabricating the same. While there are quite a number of these fabrics, and excellent claims are made for each of them, it will suffice here to pick out one or two of them, assuming that they are among the best for purposes of illustration here.

TUNGSTEN STEEL FOR USE IN THE BETTER CLASS OF MAGNETO WORK

Chemical Composition

Tungsten	5.50 to 6.00
Carbon	0.70 to 0.80
Silicon	0.15 to 0.25
Sulphur	0.03 max.
Phosphorus	0.015 max.
Manganese	0.30 to 0.35

It has been found that the tungsten is of not added value above the maximum content as here given, but it is believed that it should not fall below the minimum value stated. In relation to carbon, it is the contention that it should not go above 80

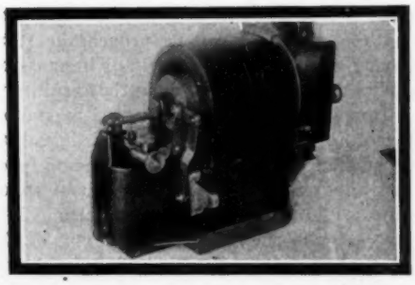


Fig. 7—Pittsfield magneto of a special type with stationary coils

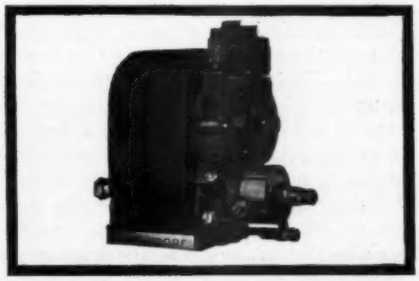


Fig. 8—Splitdorf magneto for single-point ignition utilizing double horseshoe magnets

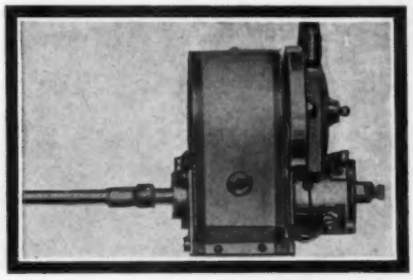


Fig. 9—Installation of the magneto on the Regal "20" motor, showing a long shaft to a gear-drive in the half-time housing.

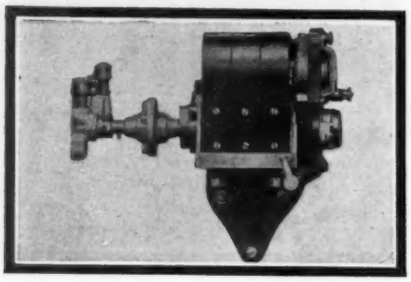


Fig. 10—Rambler magneto installation, showing a short shaft drive with a flanged joint between it and the gear in the housing

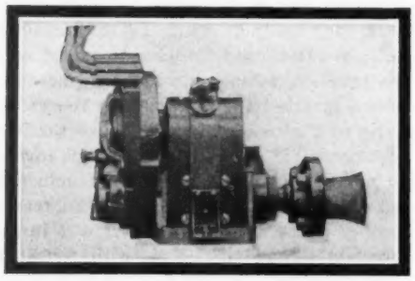


Fig. 11—Thomas Model M magneto installation with a special form of universal joint between it and the gear in the housing

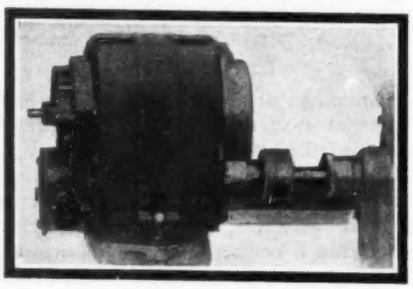


Fig. 12—Cole "30" magneto installation, showing how the drive is common for the magneto and the centrifugal pump

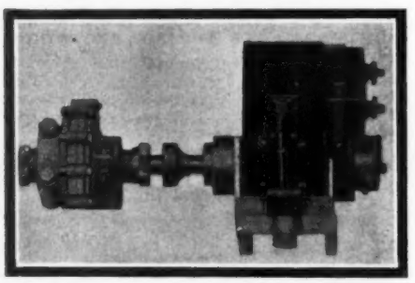


Fig. 13—Chalmers magneto installation on the "30" driven by the same shaft as for the water pump

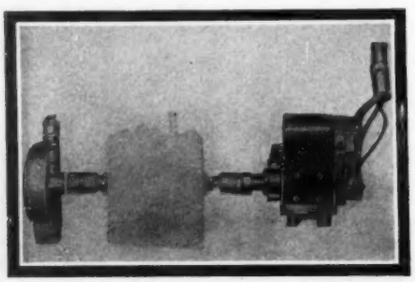


Fig. 14—Cadillac Model "30" motor, showing the magneto in place and driven by a shaft that also furnishes power for the force-feed oiler

points. This steel is known as Grade M.G. No. 22, as made by the Lindenberg Steel Company.

It is worthy of note that this steel is produced by the electric process and that the "heats" are never greater than 3 tons.

An inferior grade of magnet steel, suitable for use in the making of electrical instruments, comes from the same mill, as follows:

TUNGSTEN STEEL FOR USE IN ELECTRICAL INSTRUMENTS

Chemical Composition

Tungsten	4.80 to 5.20
Carbon	0.65 to 0.70
Silicon	0.15 to 0.25
Sulphur	0.03 max.
Phosphorus	0.015 max.
Manganese	0.30 to 0.35

The main recommendation of this grade of tungsten steel lies in the lower price at which it can be had. It is claimed that electrical instruments of a satisfactory grade are produced with this material. If so, there is no reason for employing the higher grade of tungsten steel for this purpose, but it should be appreciated that magnetos, of the class for which there is a lasting demand, should have the better grade of steel.

Influence of Tonnage Upon Quality of the Steel

The great difficulty attending the rating of steel lies in the fact that the chemical composition may be the same for several grades of the steel. A part of the variation in quality may be traced to methods of fabrication, but even when the chemical composition and the methods of fabrication are the same, it still remains to observe that there will be differences to contend with, as the process used, i.e. (a) Basic open-hearth, (b) Basic Bessemer, (c) Acid open-hearth, (d) Crucible, (e) Basic electro-steel, and (f) Acid electro-steel, which, by the way, is the newer process.

After taking proper note of all of these possibilities, the problem is only half solved. It is known in steel mills that fine grades of steel cannot be had in large heats. Tool steel, for illustration, if it is of the finest grade, is made in small crucibles, or in electro-furnaces of a capacity of not more than 3 tons per heat.

Quantity production defeats quality, referring, of course, to the finer quality of steel as it is used for the superior tools and, let it be said, permanent magnets. When the steel is being ordered, under the circumstances, it is useless for the purchaser to rely upon chemical composition, or even the process, so far as that is concerned. To be sure of the right grade of material, it is necessary to specify the tonnage of the heats. This idea is a new one from the point of view of the automobile engineer, nor is it the foundation of a doctrine that will set well upon the stomach of the average steel-maker. The fact remains that the best magneto work comes from the makers who adhere to this practice, and the only way to compete successfully is to go and do likewise.

Discussing Some of the Reasons That Underlie Present Exacting Practice

In practice, the coercive force of the magnet seems to be a property that is better appreciated than some of the more conventional magnetic properties. When it is said that a set of horse-shoe magnets, such as are used in some of the accepted forms of magnetos, will lift, say, 40 pounds, this is a measure of the coercive force. If a set of magnets is composed of two horse-shoes, one over the other, and they, in turn, are made of 3-8 x 1 1-2-inch bars, a coercive force of 40 pounds is a high value, and in such a set of magnets there is danger that the retentiveness will be of a somewhat receding value. A test, involving the use of a fine grade of electro-steel, made in a 3-ton furnace, showed a coerciveness of 36 pounds when the magnets were first magnetized, but after 50,000 miles of service as measured in an automobile, the coerciveness fell away to 32 pounds—this set of magnets were of the dimensions as above given. In another test, when the coerciveness was 40 pounds, using a set of magnets of the same dimensions, the coerciveness diminished to a nominal point almost at once, thus indicating that the retentiveness was too low to make it possible to consider the use of this grade of steel.

The average user of an automobile, if he desires to test his magnets for coerciveness—lifting power—has little to do beyond hanging a weight on the "keeper" and, adding the weight of the keeper to the weight that he uses and ascertain, thereby, the lifting power of the magnets. It would be too much to expect that the lifting power would be quite 40 pounds, but it should not be below 30 pounds. In making a rough test of this sort it is necessary to have good contact between the keeper and the ends of the magnets to be tested, and the best way to obtain this contact is to have the ends of the magnets ground, and then, by "bluing" the surfaces, using Prussian blue, make sure of a good surface contact all over.

Relative to Some of the Promises That Failed to Materialize in Actual Practice

Regarding the shape of the metal used in the magnets, there is little to be said after it is shown that a given shape produces the maximum of result. The fact that some particular shape is popular means nothing unless it can be proven that that shape affords a better result. The mass of metal used has bearing upon the result, and in many of the better makes of magnetos, according to data in hand, it is usual to expect an induction of 60,000 lines of force per kilogram of the steel used (about 25,000 lines of force per pound of metal) and it is necessary to employ such an amount of the steel as to approximately check up with this estimate.

Nickel steel is so popular that it is extremely difficult to get some makers to un-

derstand that it is not good for this class of work. Nickel has properties that are valuable in structural materials, but an electro-magnet, or a permanent magnet, does not belong in the category of structures, leastwise the primary consideration is beside the question of mechanical strength, and if the magnets do have to serve as members in the structure from a strength point of view, it is well within the ability of a very ordinary grade of steel to accept the responsibility. From the electro-magnet point of view—and permanent magnets form, if anything, a more exacting class—nickel causes a decrease of retentivity, although it does add to the coercive force. With 26 per cent. of nickel the material becomes non-magnetic. In the process of heat treatment it has been found that, at 900 degrees centigrade, and quenching, the coercive force of the nickel alloy is greatly diminished.

Taking tungsten, holding carbon at a nominal point, the iron, so made, is not satisfactory for permanent magnets. This is as much as to say that a binary of tungsten and iron is not a good material to use. Adding carbon within certain limits, as before indicated, seems to afford qualities that are desirable. It is frequently claimed that vanadium added to the mixture would be beneficial.

Retentivity Is the Most Desired Value From the User's Point of View

Manganese as it is ordinarily present in steel is not with the idea that it is of any great value from the permanent magnet point of view. It is claimed for this element that it adds to the coercive force, but that in retentivity it decreases. It is impossible to seriously consider any type of permanent magnet that has a low retentivity rating. Manganese steel, holding up to 4.5 to 6.0 per cent. of manganese, has been used for permanent magnets, but such fabrics are not now in vogue. At 10 per cent. of manganese the retentivity is nil.

Chromium, due to its popularity in structural work, has been mentioned for permanent magnet work, but experiment seems to show that it is not a good element to use. By adding carbon, up to the usual point as it obtains in permanent magnets, it is possible to put up with chromium, but it remains to be proven that the chromium adds anything to the value of the product. This element does add to the cost, difficulty of working and the chances of failure.

Molybdenum, if it is present without carbon, is of no recognized value. With carbon this element has value. Some of the permanent magnets that have been made with carbon and molybdenum were regarded as excellent specimens. It is more than likely that this element is present in quite a number of the steels that pass current for permanent magnet work. It is also likely that molybdenum and tungsten go together with carbon in good grades of magnets.

No matter how good the material may be from the point of view of the maker of magnetos, if he disregards the factor of retentivity the user of the magneto is bound to find, at his cost, that the magneto will fail him, perhaps within a month, maybe within a six-month, but, at all events, sooner or later, and, after all, what he most desires is a magneto that will work when it is new and continue to work as long as may be required, or, at all events, until the motor wears out. It is frequently claimed that the magnets may readily be rejuvenated, and that it merely remains for the user to remove the magnets and have them re-magnetized. Very fine! But the user does not invest in an automobile for no better purpose than to go into the business of rejuvenating permanent magnets. Nor will it be necessary for him to do so if the magnets used are so designed, of such metal, that the magnetism will manifest itself on a constant basis, or nearly so. True, this quality puts the maker of the magneto to some trouble. It is necessary for him to use more steel, more inductors on the rotor, and to adjust the speed of the rotor to suit the weaker field, if it may be said that a magneto of excellent retentivity will have a diminished value of the flux of the magnetic force.

Standardize the Installation of Magnetos

PURCHASERS of automobiles, like investors in any other field of endeavor, are conservative, and it is pleasing to them as investors to find as many safeguards around their investment as can be had at a reasonable cost. It would not be desirable to add to the safeguards to an extent that would bring the expense account up above the value of the improvement. When a purchaser goes after a car, beyond getting an automobile that would seem to check up with his immediate requirement, he is confronted by the future, and if he is a thinking man he will know that the time must come when it will be necessary for him to make alterations, repairs, or additions to his car in order to preserve the integrity of the investment. This is not to say that the automobile when it is purchased may not be up to the intended and fitting requirement, but, it makes no difference how good a car proves to be, the time must arrive in the course of its life when it will be expedient to make repairs with the idea of obtaining further service, but it would be inexpedient to incur a large cost in repairing the car unless it could be shown that the added investment would bring its measure of reward.

Reducing this idea to a discussion of the ignition problem, it would not be difficult to find quite a number of automobiles that were benefited in the course of their life either by replacing the old magneto with a new one of the same make or by the installation of a new magneto of some other

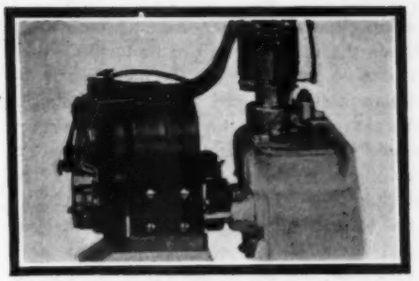


Fig. 15—Amplex 2-cycle motor, showing magneto that is designed to advance the spark nearly 60 degrees

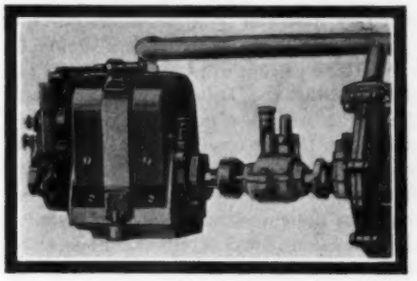


Fig. 16—Speedwell motor, showing the magneto installation and the shaft drive common to the magneto and the water pump

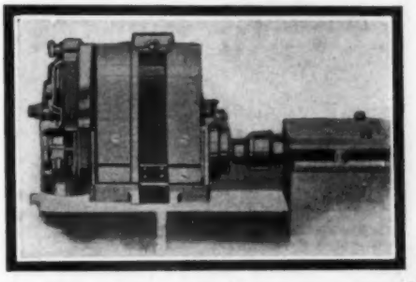


Fig. 17—Stearns 30-60 motor, showing the magneto on a shelf driven by a shaft with a universal joint between it and the gear in the housing

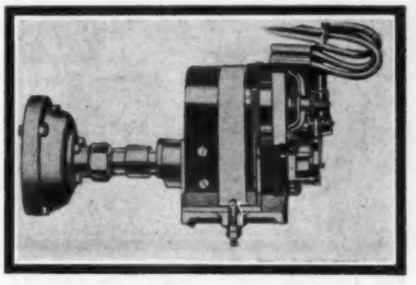


Fig. 18—Stoddard-Dayton "30" motor, with the magneto on a shelf close to the gear case from which power is taken

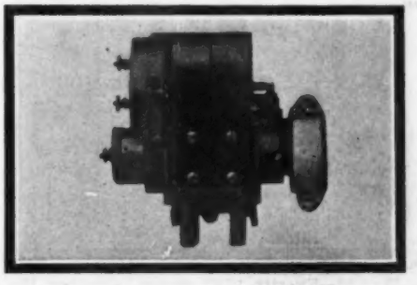


Fig. 19—Hupmobile, showing the method of installation of the magneto and the cover over the gear of the drive

make. It would add nothing to the cost of either the magneto or the motor to which it is to be attached were the methods of installation standardized so that any make of magneto could be attached to any make of motor without having to do machine work, or otherwise change the makeup of the mechanisms. That it would be an advantage to realize interchangeability in this regard would be true even at a considerable extra cost, but when this advantage can be obtained without any extra cost at all it does seem as if this is a plea for interchangeability of parts that cannot be resisted by wise and progressive designers.

From the automobile makers' point of view there is an argument in favor of standardizing the ignition equipment and the methods of its installation. If a maker contracts for 10,000 magnetos, and the builder of the magnetos, for any reason, fails to live up to his contract, if the maker of these automobiles has so designed his motor that it will only accommodate the magneto contracted for, it is difficult to see how the automobile maker is going to extract himself from his dilemma at a reasonable cost, or how he will be enabled to deliver the automobiles to the awaiting public at the propitious time.

Just what it would cost an automobile builder to maneuver himself into a situation as here described is hard to estimate. There would be a considerable effort required in the rebuilding of the motor case so that it would accommodate some other make of magneto, and it would be extremely difficult to convince an exacting clientele that the makeshift would be a desirable investment, but none of these difficulties would measure up with the loss that would come were the maker of automobiles to be put back for a whole month in the delivery of his product.

It is worth while saying that magnetos do not differ from each other in general proportions to a very great extent, as they are now made, and it would require but a small effort on the part of a suitably endowed committee to unify these small differences and place the question of installation of magnetos on the high plane where it will have to be ere it can be said that this phase of automobile building is a settled matter.

In the early days of the building of automobiles the stock arguments among salesmen were founded upon the differences that resided in the automobile that they represented as compared with the automobiles of their competitors. It did not take the users of cars a long time to discover that these differences were to their sorrow, nor are they to be abhorred on the ground that an innovation is to be shunned, but for the reason that it puts all of the purchaser's eggs in one basket, so to say, which is a practice that wise men do not recommend. A more enlightened automobile public confronts the makers of cars to-day, and the key to success is held in the hollow of the hand of the statuesque figure known in modern plants as "Standardization."

Don't fear your self-appointed enemies; they are more scared of you than you can be of them.

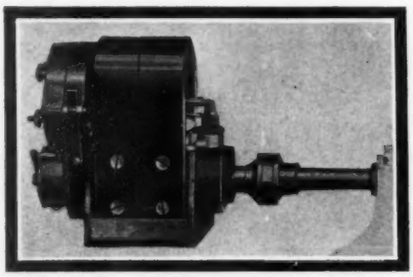


Fig. 20—Hudson magneto installation utilizing a lateral shaft and a spiral gear for the drive—magneto located on right side of motor

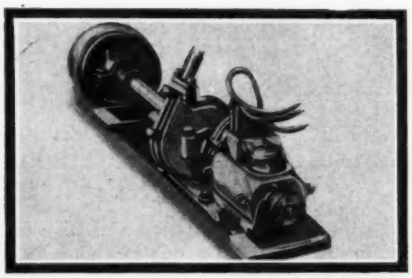


Fig. 23—Firestone-Columbus motor presenting the Mea magneto on a shelf, driven through the water pump

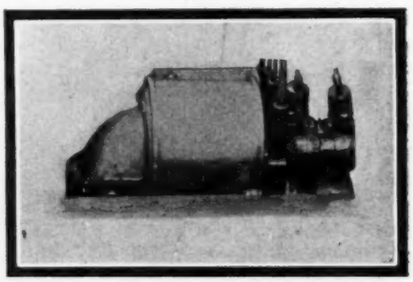


Fig. 26—Derain motor, showing the magneto on a short shaft with an Oldham joint between the magneto and the gear

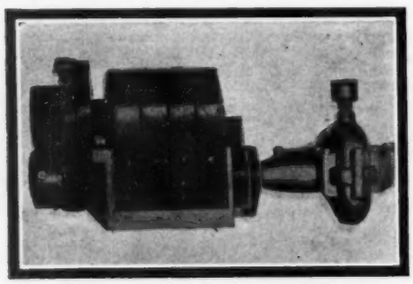


Fig. 21—Glide motor, showing the magneto on a shelf taking power from a gear in the half-time case—the magneto is located high up

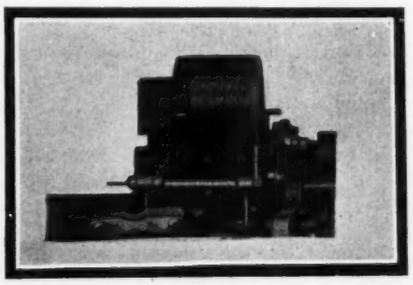


Fig. 24—Maxwell motor, showing the magneto on a plate back of the cylinders, bringing it under the foot boards

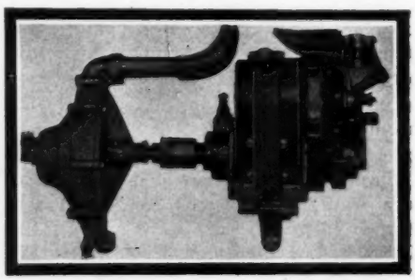


Fig. 27—Marmon motor, showing the magneto on a shelf, driven by a shaft that also delivers power to the water pump

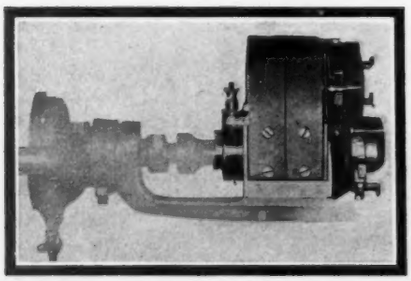


Fig. 22—Everitt "30" motor, showing the magneto drive through the water pump with an Oldham joint between

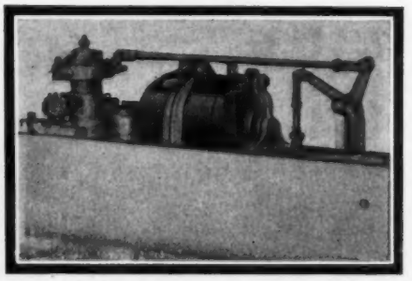


Fig. 25—Matheson motor, showing the magneto and how it is housed in by the flanging of the motor case

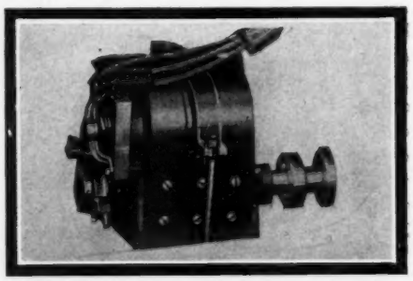


Fig. 28—Lozier motor, showing the magneto in a shelf and a short-shaft drive with a flanged connection between it and the source of power

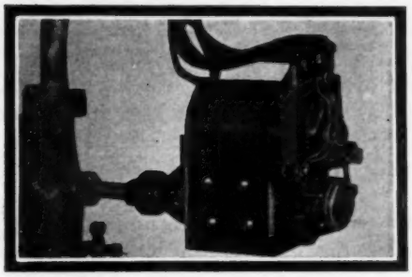


Fig. 29—Kline Kar, showing the magneto installation and the shaft that also furnishes power to drive the water pump

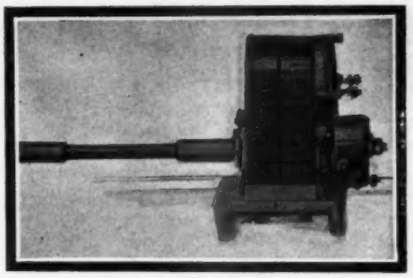


Fig. 32—Ohio motor, with the magneto located on a shelf and driven by a shaft extending out from the half-time case

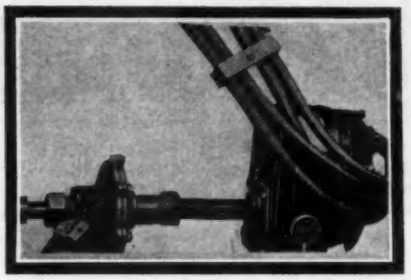


Fig. 35—Flanders "20" motor, made at the E-M-F plant—magneto and water pump driven by a common shaft

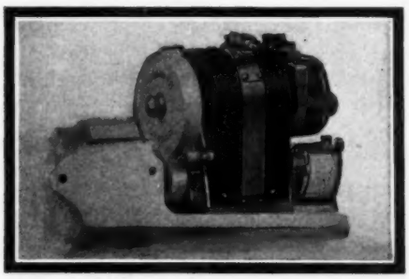


Fig. 30—Packard motor, showing the installation of the Packard-Eisemann magneto locating the magneto close up to the driving member

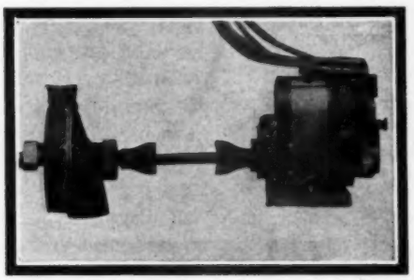


Fig. 33—National motor presenting a magneto drive that includes a tumble shaft between magneto and pump, which is also driven by same gear

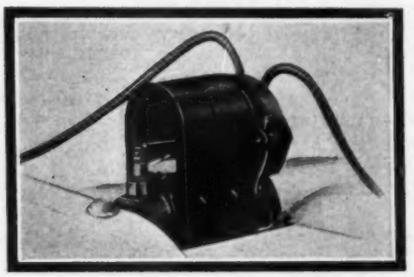


Fig. 36—Sternberg motor of the double opposed type, placing the magneto on the top of the case taking power from the timing gears

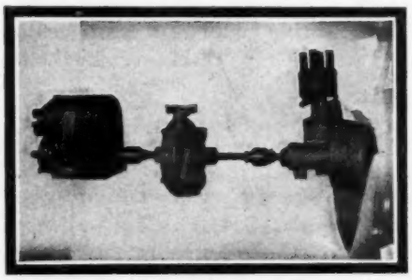


Fig. 31—Velie motor, with the magneto located at the rear, taking power from the half-time case at the front

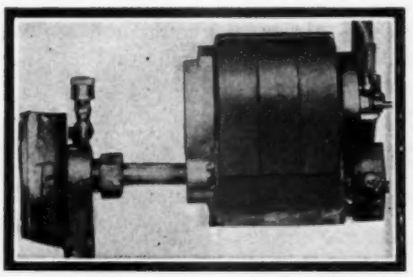


Fig. 34—Moon motor driving the magneto and the water pump from the same source of power

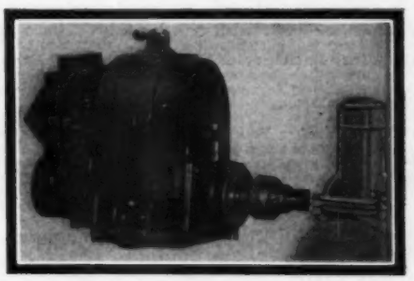


Fig. 37—Adams motor, with a lateral drive for the magneto and water pump—showing the magneto on the right side of the motor

Coming Events

Catalogue of Future Happenings in the Automobile World That Will Help the Reader Keep His Dates Straight—Shows, Annual Meetings and Other Events

Shows and Exhibitions

Mar. 4-11	Boston, Mechanics' Building, Ninth Annual Show, Licensed Automobile Dealers' Association.
Mar. 4-11	San Francisco, Cal., Annual Show, San Francisco Motor Club.
Mar. 7-11	Des Moines, Ia., Third Annual Show, Des Moines Automobile Dealers' Association, Coliseum.
Mar. 14-18	Syracuse, N. Y., Third Annual Show, Syracuse Automobile Dealers' Association, State Armory.
Mar. 14-18	Denver, Col., Annual Automobile Show, Management Motor Field, Colorado Auditorium.
Mar. 15-18	Louisville, Ky., Annual Show, Louisville Automobile Dealers' Association, First Regiment Armory.
Mar. 18-25	Pittsburg, Annual Show, Pittsburg Auto Show Association (Inc.), Exposition Hall.
Mar. 25-Apr. 1	Buffalo, N. Y., Fourth Power Boat and Sportsmen's Show, Sixty-fifth Regiment Arsenal, Buffalo Launch Club.
Mar. 27-30	Jacksonville, Fla., Beach Races, Jacksonville Motor Club.
Mar. 25-Apr. 8	Pittsburg, Fifth Annual Show, Duquesne Garden. First Week, Pleasure Cars; Second Week, Commercial Trucks. Automobile Dealers' Association of Pittsburg, Inc.
Mar. 18-25	Montreal, Can., Automobile and Motor Boat Show, Drill Hall, Automobile and Aero Club of Canada.

Race Meets, Runs, Hill-Climbs, Etc.

Mar. 27-30	Jacksonville, Fla., Beach Races, Jacksonville Motor Club.
April 29	Guttenberg, N. J., Track Races.
April 8-9	Los Angeles, Cal., Twenty-four Hour Track Race, Los Angeles Motordrome.
Date indefinite	Oakland, Cal., Track Races, Oakland Motordrome
Date indefinite	Shreveport, La., Track Races.
April 29	Philadelphia-Atlantic City Roadability Run, Quaker City Motor Club.
Mar. 12	Los Angeles, Cal., Track Match Race, Los Angeles Motordrome.

Mike—Phwat's the matter wid yur face, Casey?

Casey—I was cumin' down the streat last night and at th' corner of Thirty-fourth streat I was introjuced to wan of thim milionairs.

Mike—G' on, when did locomotives look like thim moneybugs?

"Faith," broke in Casey, "this wan was bowling along in an automobile."

THE AUTOMOBILE

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TRANSPORTATION problems are receiving the attention of every thinking merchant, but an investigation of the subject fails to disclose any serious attempt at keeping proper records of the cost of delivering goods; moreover, so it would seem, the datum in relation to the transfer of goods by horse-drawn vehicles is quite as meagre as it is in the automobile undertaking. It seems to be the practice in the delivery field to disregard the items of cost, perhaps on the ground that the delivery of goods is a necessary evil. The doctrine of adding one evil to another, which has apparently been practiced in this field for many years, probably accounts for the uncertainty which prevents the average merchant from taking the initiative along the newer lines. It is easy to understand how a business man reaches the conclusion that he should go slowly when it comes to an investment of some moment, if the information at his disposal is so lacking that he cannot even tell where his money goes.

* * *

THOUSANDS of estimates of the cost of delivering goods have been made in the course of the last few years, and it is a great misfortune that nearly every one of these estimates was the merest dream put into words by men who, when they went in quest of actual datum, found that it was not to be had. It was only the other day that the Editor of THE AUTOMOBILE went to a large trucking concern in New York, and after a painstaking effort to obtain data that should be available as the result of many years of business, had to go away without a scrap of information that would be worth a cent. This large establishment has been doing business all these years without learning what it costs to buy and maintain horses, or the expense of the upkeep of trucks, or how much oats is purchased per month, or the value of blankets, or the other items of cost of maintenance that have to be reckoned in if an estimate is to be made of the value of horse-drawn trucks in commercial pursuits. The manager of this concern stoutly maintained that freight automobiles were no good. But when he was accosted on this point he reluctantly admitted that he never inquired into the matter at all.

* * *

EDUCATIONAL methods will have to be pursued in the automobile business for a number of years in order to correct the evils that seem to permeate the freight automobile situation. It is just possible that the men who now have charge of the delivery of goods in the large mercantile establishments will mend their ways, but if they persist in the disregard of business principles they will ultimately be supplanted by those who will have the good sense to keep a record of what they do for the purpose of profiting by experience. There seems to be a certain fixed attitude that governs the conduct of a great many men as they are confronted by the automobile problem, and they are wont to say: "We are from Missouri," although there is not one among them who would not starve to death within nine days were he to maintain this "show me" attitude toward his own kitchen.

* * *

BOSTON is being entertained by the Ninth Annual Automobile Show, and the makers of automobiles, flanked by a large number of accessory makers, are displaying their wares in Mechanics' Hall to an audience that if it were critical last year is critically intelligent to-day. The earlier attitude of the patrons of the automobile show was expressed in the interrogation, "What kind of an automobile shall we buy?" This year has witnessed the birth of a poor crop of question marks, placing in substitution an audience that is fully alive to the measure of its need, and capable of describing its requirement, leaving it to the exhibitors to deliver the goods or go back home. But it is to the credit of the automobile business that the patrons of the industry are expressing satisfaction, and the volume of business that is being done is of the kind that places well-made automobiles at the disposal of the purchasers.

* * *

ARMY transportation is a theme of which the automobile industry has only heard the beginning, and that the army will have to be lifted out of its thraldom either by a process of elimination or through educational methods, seems to be true, if it may be taken for granted that the expression as it is made in a letter which appears in THE AUTOMOBILE this week is founded on common belief among the men of military affairs. If the army in 1911 is bound by the dictum of the Roman conquerors, i. e., "An army crawls on its belly," it merely goes to show that the army's estimate of the value of a freight automobile, and the work it is capable of doing, has been formed by the officers who are riding around Washington in high-speed passenger automobiles.

News Section

Happenings of the Week in Various Parts of the Country as Gathered by the 85 Special Writers and Correspondents of "The Automobile"

Contest Board Commutes Case-Strang Sentence—Preliminary Meeting of the A. M. A. A.—Vice-President DeLisser, of the United States Motor Company, Relates His Experience With Some Prospectives—Big Entry List for 500-Mile Race at Indianapolis—Pittsburg Show Will Continue Three Weeks—Reeves Addresses Y. M. C. A. Students—Short News of the Trade From All Sections of the Country—Some Points Regarding Accessories Picked Up at the Boston Show

Contest Board Commutes Case-Strang Sentence

COMMUTATION of the sentence imposed upon the J. I. Case Threshing Machine Company and Lewis Strang, its racing manager, for failing to put in an appearance at the recent race meeting at New Orleans was made Wednesday after all the facts in the case had been considered by the Contest Board. The original penalty was to have been one year's disqualification for both company and driver, but after the hearing on Wednesday the board reduced the sentence to thirty days in each case. As the disqualification took place as a result of a cause that accrued on February 24, the time will be up March 26 and the cars and driver will be eligible to compete in the Jacksonville races scheduled for the latter part of this month.

The facts as they were presented to the board showed that Strang had been ill and on account of his illness was unable to complete the racers. Because he was in full charge of the team and cars, the Case company did not take it upon itself to notify the race promoters of the hitch in the arrangements and affidavits from Strang were introduced to show that he was unable to do so. He did wire the promoters of his inability to start, but the telegram was only received the day before the meeting.

Other matters that were adjudicated by the board were as follows: The San Antonio International Fair Association which staged an Oldfield race meeting after the ban had been placed upon that driver was suspended for three months. The association has an application for registration on file with the board which will be acted upon after the term of the suspension is completed.

The Ascot Park track was also given an extra penalty of three months for allowing an outlaw meeting on January 7-8 and all the officials and drivers were given that length of suspension. In addition to those who were suspended some time ago for similar cause, Frank Chance, who acted as starter, was given a year and the same penalty was given the automobile editors of the Los Angeles *Examiner* and *Times* who acted in official capacities at the meeting. James B. Ryall and Arthur Okeman, both of whom have been drivers registered with the board, were suspended for a year.

Sanctions were granted to the Guttenberg (N. J.) track, the Indianapolis Speedway, Amarillo (Tex.) Speedway and the State Fair Associations of Louisiana and Texas, which are located at Shreveport and Dallas respectively.

The representative of the board who has been busy for a month preparing a tentative plan for a closed racing circuit passed through New York this week and during his visit made a preliminary report of his findings to Chairman S. M. Butler. Mr. Butler states that the full report of this representative will be made next week. The tenor of the preliminary report was favorable and hopeful and it is considered as good as settled that the circuit idea will be realized this season. It is understood that enough signatures have been secured to insure the project.

As far as the national reliability tour is concerned the statement is made unofficially that the route will be from Washington to Ottawa and that the start will be in the latter part of June. The course may be by either of three routes. The first of these is via Philadelphia, Binghamton, Saratoga, Quebec to Ottawa, occupying seven running days; the second of these would be slightly more direct, cutting out Quebec, but following a slightly longer route in New York State. The third would be by the way of Philadelphia, Binghamton, thence across the southern tier of counties of Western New York, crossing the Niagara river at Buffalo and thence around the west end of Lake Ontario and through the thickly populated section of Ontario to Ottawa.

Chairman Butler is working upon a plan to secure the cooperation of all the race tracks in the country in a vast registration scheme. So far most of the big cities have joined the movement, particularly those for which tentative grand circuit dates have been arranged. The State of Pennsylvania has registered more half-mile tracks than all the rest of the country combined, but Mr. Butler is making an earnest effort to secure a similar volume of registrations in other sections.

Independents Meet and Incorporate

Meeting for the first time since organization, which was accomplished in rough form during the last week of 1910, the Automobile Manufacturers' Association of America assembled in New York last Tuesday. The meeting was held in the new quarters of the organization in the Day and Night building and was attended by a rather small number of representatives of the industry.

President Campbell and several others heard the reports of the tentative committees, the chief of which was the one which has had charge of the incorporation of the organization. The future of the association was discussed in some detail and trade conditions were considered from the viewpoint of the manufacturer. Adjournment was taken to a date to be selected some time in the future.

Diplomats in Great Luck

WASHINGTON, D. C., March 6—Under a ruling of the Secretary of the Treasury the regulations as to automobiles of foreign manufacture imported into this country by owners for bona-fide touring purposes, under bond for a period of three months, has been amended to a six-months' period.

What the Purchaser Might Expect

Vice-President Horace DeLisser of the United States Motor Company Has Something to Say for the Benefit of the User

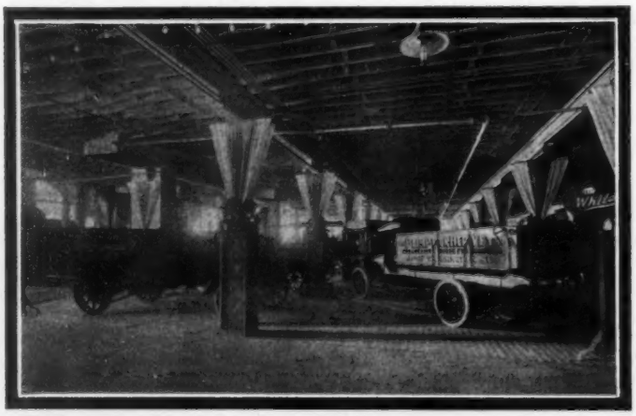
WE have no agents! This sort of a statement at the bottom of an advertisement in an agricultural magazine is frequently the foundation of a smile, and the occasion for mild amusement. The idea seems to be that the goods so advertised should be more attractive to the prospective buyer. The farmer, be it understood, is the mainstay of the mail-order house, and is the individual who usually insists upon buying his farm machinery, pitch-forks, milk-cans, as well as his dress suit, direct from the manufacturer at wholesale prices. This does not signify that the merchandise so purchased will be low of price. The dominant idea of our agricultural friend is founded on his imagination that he is dealing directly with the maker, thus beating the middleman out of his profit.

I am constrained to generously disagree with this ilk of farmer and his kind, as his reasoning is brought forcibly to my attention in the letters which express with vehemence worthy of better things the idea that he would not be so "easy" as to buy an automobile from the automobile dealer controlling that territory. Moveover, the objectors to dealing with district representatives are not all in the farming business, as the following extract from a letter which was written by a physician will show:

"I have a very concise idea of just what I want in the motor car line, but the obstacle is the great graft connected with such a purchase. The intervention of the middleman is superfluous, except for the honor to affix a two-cent stamp to my order, and lining his pocketbook with a hundred or two of my hard-earned dollars for his trouble. Don't you think that a commission of 10, 15 or 20 per cent. on such an order is an exorbitant amount of money to pick up on a do-nothing and a risk-nothing job?"

I do not know whether the doctor has bought a car or not. If the doctor is as good a physician as he is unwise in his ideas about automobiles, he should have no trouble in paying the agent's commission. At all events, if it is clear that automobiles must be made in quantity if the price is to be low without affecting quality, it remains to observe that an extensive market must be established for them; and a product of considerable magnitude cannot be sold to users without the aid of distributors.

Were the doctor to be confronted by his own logic, his suffering patients would entertain medical advice from the fountain's source—the university. The dealer does not receive his commission for the small service which is represented in the purchase of a two-cent stamp and the mailing in of an order. If the agent is a man of intelligence, and he must be to retain his position in a company of stamina, his time is taken up in the extension of courtesies to his clientèle, adjusting automobiles, instructing, and in making both ends meet.



The White exhibit in the basement of Mechanics' Building, Boston

Hoosier Sweepstakes Well Filled

INDIANAPOLIS, IND., Mar. 6—Thirty entries for the 500-mile international sweepstakes for which a purse of $25,000 has been offered by the Indianapolis Motor Speedway have been received so far. Under the conditions of the event, the cars must have a piston displacement of less than 600 cubic inches, but are not limited as to minimum weight conditions of the stock car rules.

Among the accessories at the Boston Show—Royal Equipment Co., Bosch Magneto Co., Truffault-Hartford Co., Star Rubber Co. and the McCue Co.

The list to date includes the following cars, specifications and drivers. The race will be held on Decoration Day, May 30:

Car	Piston Displ'em't	Driver	Entrant
Case	284	Strang	J. I. Case Co.
Simplex	Special	.....	Simplex Auto Co.
Inter-State	390	Baldwin	Inter-State Auto Co.
National "40"	447	Aitken	Nat'l Motor Vehicle
Pope-Hartford	390	Disbrow	Pope-Hartford Co.
Pope-Hartford	390	Fox	Frank P. Fox
Westcott	Special	Knight	Westcott Motor Car
Case	284	Jagersburger	J. I. Case Co.
Case	284	Larsonneur	J. I. Case Co.
Stutz	390	Anderson	Stutz Auto Parts Co.
Mercedes	583	Wishart	Spencer E. Wishart
Amplex	443	Turner	Simplex Motor Car Co.
Marmon	...	.....	Nordyke & Marmon
Marmon	Special	Dawson	Nordyke & Marmon
Knox	...	Belcher	Knox Auto Co.
Marquette-Buick	594	.....	Wadsworth Warren
Marquette-Buick	594	.....	Wadsworth Warren
Benz or Fiat	...	Hearne	Edward A. Hearne
Alco	579	Grant	Am. Locomotive Co.
National	447	.....	Nat'l Motor Veh. Co.
National	447	.....	Nat'l Motor Veh. Co.
McFarlan	248	.....	McFarlan Motor Car Co.
McFarlan	377	.....	McFarlan Motor Car Co.
Jackson	354	Ellis	Jackson Auto Co.
Jackson	354	Cobe	Jackson Auto Co.
Jackson	432	.....	Jackson Auto Co.
Cutting	...	.....	Clarke-Carter Auto Co.
Fiat	597	Bruce-Brown	David L. Bruce-Brown
Marquette-Buick	594	.....	Dr. W. H. Chambers
Firestone-Columbus	550	Frayer, Richenbacher	Columbus Buggy Co.

Reeves Tells of Industry

Alfred Reeves, general manager of the A. L. A. M. told of the opportunities for young men afforded by the automobile industry in an address delivered before the automobile school of the Bedford Branch Y. M. C. A. last Friday night.

Mr. Reeves outlined the careers of some of the successful men engaged in the industry and showed to the students the open door toward similar or greater success. He points to the fact, however, that the business is no easier than any other and is moving faster.

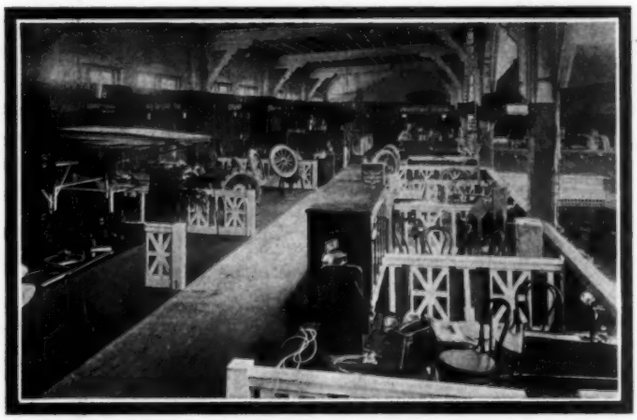
Three Weeks' Show at Pittsburg

PITTSBURG, Mar. 6—Pittsburg and vicinity have been stirred into automobile enthusiasm, in anticipation of three continuous weeks of automobile shows. For the first time in its history the city is to have two shows, running consecutively from March 18 to April 8.

The city and the entire countryside has been emblazoned with bill posters and show cards.

The first show, which opens in Exposition Hall, March 18 is including a great exhibit of aeroplanes including the Curtiss, Bleriot and other flyers.

Exposition building has a larger main floor space and larger



Where the Pantasote Co., Consolidated Rubber Tire Co., Cramp Co. and Hartford Tire Co. held forth at Boston Show

balcony area than Madison Square Garden and the show promises to be the largest ever held in Pittsburg. One of the unique features of the exhibition will be heating the building by electricty.

The Duquesne Garden show has reserved a second week for motor trucks and will also show motor boats. Both shows are being liberally patronized by exhibitors. The Exposition show management reports assignment of space to 56 manufacturers, some of whom will probably remove their exhibits to the second show.

How It's Done in Nevada

Following is a copy of the motor vehicle law of the State of Nevada:

"SECTION 1. From and after the passage of this act, any person or persons, firm, company, corporation or association who keeps or uses automobiles of any description, for hire or rent, shall obtain from the sheriff of the county in which such business is transacted a license for the transaction of such business and pay therefor the sum of two dollars and fifty cents ($2.50) per month.

"SEC. 2. Any person violating the provisions of this act shall be guilty of a misdemeanor and punished by a fine of not less than twenty dollars ($20), nor more than one hundred dollars ($100), or by imprisonment in the county jail for a term not exceeding sixty days."

Minneapolis Journal Prints Fine Issue

Certainly the largest special automobile number ever published by a daily newspaper in the West was the recent show number of the Minneapolis *Journal*, which appeared February 19, the day following the opening of the show. The *Journal* is a paper of very large circulation and influence, and the automobile number comprised forty-two full-sized pages devoted exclusively to the automobile.

The cover was in color and was well executed and artistic in its construction. The number contained hundreds of articles covering all the phases of the motoring art from its inception to date, many of which were original and many contributed by the heads of factories and automobile associations of various kinds. The practical and technical articles were taken largely from THE AUTOMOBILE and included over a dozen, the important ones being prominently credited. These included tabular articles on clutch, ignition and carbureter troubles and their cures, and an exhaustive article with illustrations on lubrication.

The support given to the industry by the *Journal* in this number and in its general attitude speaks volumes for its far-sighted management.

Six Months for Joy Riding

WINNIPEG, CANADA, Mar. 4—The Manitoba government this week sent through several amendments to the automobile act. Six months in jail is provided as a maximum penalty for persons stealing cars for the purpose of "joy riding." Examinations are provided for all chauffeurs, to be conducted by a committee appointed by the government. All chauffeurs must be over eighteen years of age before receiving a license. Dealers must send in monthly reports of all sales negotiated.

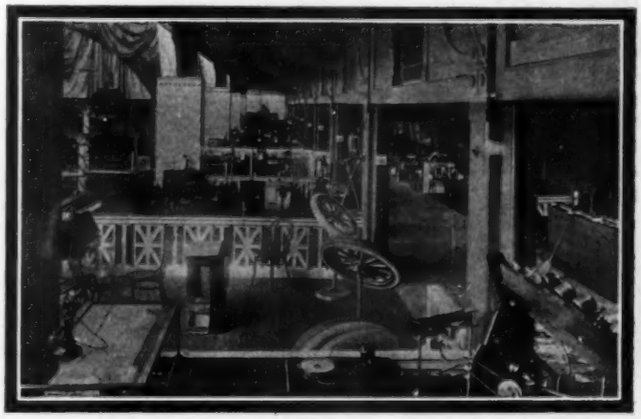
Quakers' Spring Event

PHILADELPHIA, March 6—Official sanction of the Contest Board to hold the event having been secured, entry blanks for the fourth annual sociability run of the Quaker City Motor Club will be issued by Secretary A. T. James next week.

The run will be from the club's headquarters, Hotel Walton, to Atlantic City and return, and a novel and attractive route will be mapped out for the tourists and worth-while prizes offered. Having had a taste of Spring weather during the present week, the event is attracting much interest and is expected to prove a winner in point of the number of participants.

Teaboldt Eastern Representative for Everitt

The Metzger Motor Car Company of Detroit, announces that C. R. Teaboldt Company, 1597 Broadway, New York City, has been appointed eastern factory representative for the "Everitt 30" cars.



Looking along Accessories Row in gallery of Mechanics' Hall

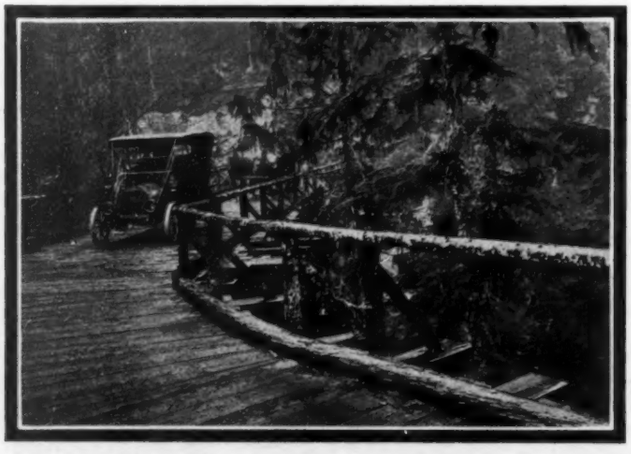
British Cars Will be Entered in French Race

PARIS, Feb. 25—For the first time in the history of European motoring there is the possibility of a big British entry in a road race held in France. The event is the Light Car Race to be run at Boulogne-sur-Mer on Sunday, June 18, by cars of not more than 3 liters cylinder capacity, or four-cylinder models of 3 to 3 1-2 inches bore. Arrol-Johnston, of Paisley, Scotland, has entered a team of three cars to compete against the Frenchmen, and it is confidently expected that the other British firms who will follow this lead are Argyll, Vauxhall, Calthorpe, and probably Star.

At present the cars regularly entered are four each from Lion-Peugeot, Gregoire, and Excelsior factories, and the team of three from Arrol-Johnston. The race has appealed to manufacturers to such an extent that it is confidently believed that 60 cars will line up on the seashore course next June, the racers coming from France, England, Belgium, Germany, Italy and Spain. It is interesting to note that the big firms—those firms which supplied all the interest during the active racing season from 1900 to 1907, will not compete. There will be no Renault, Panhard, Darracq, Delaunay-Belleville, Brazier, Mors, or Hotchkiss entries, although all these firms build the type of car for which this race has been organized. Their place will be taken by the younger and more vigorous firms such as Gregoire, Sizaire, Alcyon, Rolland-Pilain, Delage, etc., in France; Hispano-Suiza from Spain; Fiat from Italy, and Opel and Benz from Germany.

In addition to this light car race, undoubtedly destined to be the most popular sporting event of the year, there will be a Grand Prix de France into which the French firms refuse to enter. Notwithstanding this the Automobile Club of the Sarthe district still maintains that the race will be held, the explanation of its optimism being that it has in hand a private engagement by which one leading Italian firm and two important German factories guarantee to start whatever the number of entries. It would certainly be unique if an international race should be held by a French club over French roads without a single French entry. Yet it is quite possible, for the old guard refuses to come forward and the smaller and younger firms have neither the money nor the experience necessary for building cars of unlimited power.

The French government looks kindly on the race and has already intimated that no difficulties will be raised in the granting of the use of the roads. Indeed it is quite possible that a special government prize will be offered in addition to the cash prizes offered by the Sarthe club.



E-M-F "30" on bridge over Christine Falls, Mt. Rainier, Wash., between Longmire Hot Springs and Nisqually Glacier during climb to clouds

N. A. A. M. Committee Named

At the meeting of the Executive Committee of the N. A. A. M., President W. E. Metzger presented, and the meeting approved, the following list of members of standing committees for the year:

Traffic Committee, A. L. Pope, chairman, L. H. Kittredge, W. R. Innis; Membership, J. W. Gilson, chairman, S. T. Davis, Jr., Thomas Henderson; Show, Thos. Henderson, chairman, A. L. Pope, H. O. Smith; Good Roads, R. D. Chapin, chairman, S. D. Waldon, C. C. Hildebrand; Legislative, S. T. Davis, Jr., chairman, Benjamin Briscoe, Charles Clifton; Auditing, Benjamin Briscoe, chairman, S. T. Davis, Jr., Charles Clifton.

The committee heretofore known as the Contest Committee will hereafter be known as the Committee on Contests and Demonstrations. The change is due to the fact that demonstrations of commercial vehicles rather than contests between them will be promoted. The members of the committee are: H. O. Smith, chairman, W. T. White, Benjamin Briscoe.

A new committee on commercial vehicles was created. E. S. Kelly, S. D. Waldon and Walter C. White were appointed with power to add two other members.

The report of the Chicago show indicated that the treasury had been enriched to the extent of approximately $45,000. The association now has nearly $90,000 with which to carry on its work in connection with good roads, contests, demonstrations, legislation, traffic regulation, etc.

In view of the demand being made upon manufacturers to take part in exhibitions, and particularly in exhibitions of commercial vehicles, it was decided to suggest to the trade that no contracts be entered into until the new show committee has met and discussed the subject fully. The show committee will meet on Wednesday, April 5.

Nyberg Buys Rider-Lewis Plant

ANDERSON, IND., Mar. 6—The transfer of the property of the Rider-Lewis Company of this city to the Nyberg Automobile Works, Inc., has been reported and the purchasing company is preparing to market the Nyberg models on a considerable scale, as the information goes.

The plant consists of a one-story building, 500 by 100 feet, with two wings each 100 feet wide and running back 150 feet. Office building, boiler-room, blacksmith shop and testing department are housed in separate buildings. The Nyberg company has been established since 1899.

Plans of Haynes Company

KOKOMO, IND., Mar. 6—The fire which destroyed three buildings of the Haynes Automobile Company, February 28, did not serve to check manufacturing more than twenty-four hours, according to announcement made by the management. No completed cars were burned and the rebuilding of the lost units of the plant will commence as soon as the insurance claims are adjusted. According to plans that have been made, the new structures will be larger than the ones they will replace.

Carhartt Company at Home

Finding available space in the Plaza Hotel inadequate, owing to its rapid growth, the Carhartt Automobile Sales Company has joined the march up Automobile Row and moved into its new quarters at 1980 Broadway. The added floor space of the Carhartt Building facilitates the showing of a number of 1911 models.

Trade Brevities

Factory and Personal News Telegraphed From All Points of the Compass

SOUTH BEND, IND., March 6—The Goshen Buggy Top Company, of Goshen, Ind., has taken on a new department in upholstering high-grade automobile bodies. R. Austin, of Detroit, Mich., has charge of the new department.

KENDALLVILLE, IND., March 6—Roy Wallace, of Kendallville, Ind., has taken the agency for the E-M-F "30" and the Flanders "20." Mr. Wallace's territory will be that surrounding Kendallville.

LAPORTE, IND., March 6—Petitions are being circulated in Laporte, Ind., and vicinity asking that what is known as the Yellow River road be graveled. The road extends through the townships of Pleasant, Washington, Lincoln and Johnson and the town of Stillwell. The petitions will be presented to the county commissioners at their March meeting.

ST. LOUIS, March 6—The committee which was in charge of the St. Louis show, composed of one representative of each of the exhibiting concerns, presented F. W. Payne, show manager, with a chest of silver valued at $200 in appreciation of his efforts in making the show a success. Hattie B. Gooding, who handled the publicity for the dealers, was presented with a valuable set of pins, set with emeralds and pearls.

AKRON, OHIO, March 6—R. J. Firestone, sales manager of the Firestone Tire & Rubber Company, is making an extended tour of the Western and Pacific coast branches.

PORTLAND, ORE., March 6—The erection of an eleven-story garage will be the result of an increase in capital made the past week by the White Motor Car Company, of Portland. The capital stock of this company was increased from $50,000 to $100,000.

SEATTLE, March 6—Geo. W. Miller, manager of the Northwest branch of the Winton Motor Carriage Co., Seattle, during the past week perfected a complete reorganization of his selling staff, adding several new men and otherwise strengthening an organization which from a sales point of view is about perfect.

MERIDEN, CONN., March 6—The Connecticut Telephone & Electric Co., of Meriden, Conn., has opened up a new branch in connection with the E. J. Edmond Co., No. 1783 Broadway, New York. A factory branch has also been opened at No. 1146 Michigan Ave., Chicago, and a Philadelphia and Boston branch will soon be opened by the Connecticut company.

NEW YORK, March 6—The J. S. Bretz Co. announces that it has assumed the sole agency for the Hartford Auto Parts Co., manufacturers of universal joints and cone clutches.

DETROIT, March 6—L. C. Smith has recently been appointed advertising manager of the Abbott Motor Co.

LANSING, MICH., March 6—A. S. Bennett, secretary and manager of the Peerless Motor Company of this city for eight years, has resigned to become secretary and manager for the United Manufacturers' Association of Jackson, Mich.

HASTINGS, MICH., March 6—Residents of Hastings and of Barry county in this section are planning to encourage the building of roads by offering a bonus of $200 per mile for all roads built to lead into Hastings. This will be in addition to the state bounty for road building.

PHILADELPHIA, March 6—The Oxford Automobile Company has undergone reorganization, absorbing the old Oxford Automobile Company and the Inter-State Motor Car Company. The officers of the new concerns are: M. W. Bachman, president; C. S. Walton, secretary and treasurer, and William A. Koch. Headquarters are at Nos. 514-516-518 North Broad street, the new concern to be local distributers of the Inter-State and Brush cars and delivery wagons.

Albert C. Bergmann, assistant manager of the Fiat factory

CLEVELAND, O., March 6—Automobilists of Cleveland will be able to drive from Cleveland to Akron this Summer over a paved road. Summit county commissioners have issued bonds for more than $375,000 to pave with brick the road from Akron to north of Twinsburg.

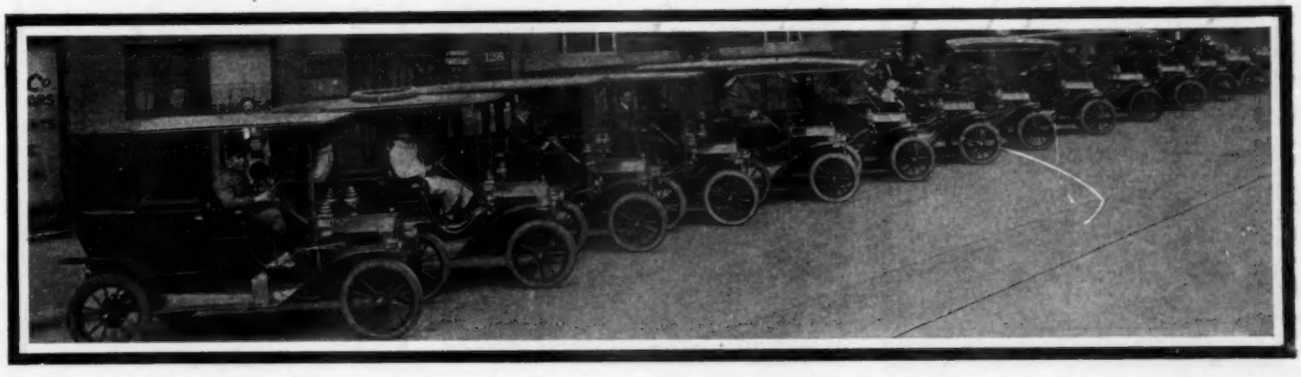
CINCINNATI, O., March 6—President C. O. Hamilton of the National Gas and Gasoline Engine Trades Association announces the Hotel Ponchartrain as the headquarters for the Detroit convention, and June 20 to 23 inclusive as the dates.

A. C. Bergmann Goes to Fiat Company

Albert C. Bergmann, an automobile engineer of large reputation and attainments, has been secured by the Fiat company's American factory at Poughkeepsie, N. Y., as assistant to General Manager A. E. Shaff. The appointment is effective March 15.

Mr. Bergmann is thoroughly versed in mechanics having served for three years as machinist and draughtsman with Smith & Mabley Co., one and one-half years with the J. M. Ellsworth Co., under Thos. J. Fay, and for three years with the Simplex Automobile Co. as manager of costs and production.

He is an active member of the Society of Automobile Engineers and is chairman of the Springs division. He is also a member of the Standards Committee in the Lock Washers and Miscellaneous divisions.



There are about 40 Ford taxicabs in Sydney, N. S. W., which are mostly owned by private owners who were old horse cabbies. As rainy days are few in Sydney, the Police Department will register an open car as a cab and will fix the meter on just the same and this class of cab is well patronized

Some Accessories at Boston Show

What the Camera Discovered During a Further Ramble Among the Accessory Exhibitors

NOTHING succeeds like success! The accessory exhibitors at the Ninth Annual Boston Show represent the cream of the industry and that they brought along the most careful selection of their wares is the voice of the spectators. If there is any complaint, it is in the nature of a surprise. The average automobilist is taken back at the number of makers of things that automobilists use, and in going to the show he is reminded in a forceful manner that he is a man of importance, for in all truth, it is the automobilist who is responsible for the 11,000 accessory industries that are flourishing in America to-day.

Old Sol Gas Lamp

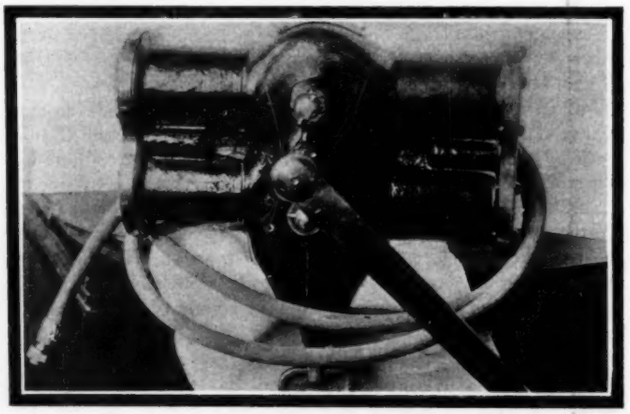
These lamps are manufactured to meet a demand for a neat and compact illuminator for runabouts. It follows the lines of the larger types with a sloping rounded hood, the size of the face being 6 inches. The reflector consists of a powerful mirror lens, which is claimed by the makers to give about 400 candlepower. The focus can be adjusted by altering the distance of the burner from the mirror through a slot in the base of the lamp. The lamp is manufactured by the Hawthorne Manufacturing Company, 35 Spruce street, Bridgeport, Conn.

Hawthorne Four-Cylinder Hand Air Pump

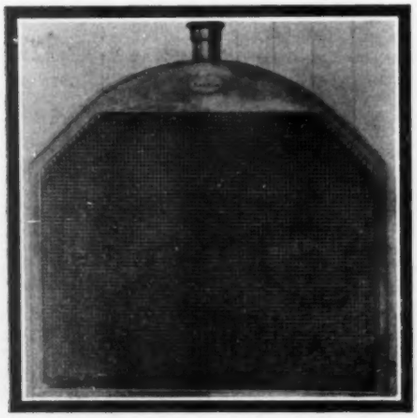
As the name implies this pump is a four-cylinder inflator for tires and is attached to the running board when required for use by means of a clamp. As seen in the illustration it is operated by a long crank handle, the rotary motion of which when turned operates the pistons. At the rear of the instrument there is a connection for the rubber hose shown which is of sufficient length to reach the front and rear tires of one side of the car. It has the advantage of costing nothing after the initial outlay. The cylinders are arranged in pairs and all four are made in a single gray iron casting, with separate head plates. The crank handle is fixed to the main shaft to which is keyed a gear wheel and with this latter two other gear wheels which have twice the number of teeth of the intermediary pinion mesh. Each of the driven pinions is screwed to a crankshaft which operates the connecting rods and pistons, which are set at right angles, so that when one set of pistons are at the end of the stroke the other pair is at midstroke. Air is admitted to the cylinders through automatic valves in the center of the pistons, each of which is supplied with a close-grained leather washer. During the compression stroke the air is forced through a passage cut in the cylinder head through a discharge valve through the center passage leading to the rubber connection. The pump is made by The Hawthorne Manufacturing Company, 35 Spruce street, Bridgeport, Conn.

Bowers Carbureter

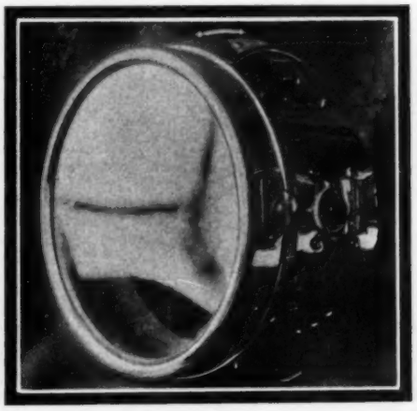
The construction of the Bowers carbureter is very simple and has but one adjustment. It is constructed on the venturi-tube principle with vertical draft direct through the instrument. The gasoline is fed into the float chamber through a needle valve which is actuated by a circular ring float made of treated cork. The jet is placed in the venturi tube and is connected to the float chamber by a passage therefrom. The amount of flow can be regulated by means of a cone-shaped pin which opens or closes the size of the pipe more or less according to the setting which is altered by the thumbscrew seen in the illustration. The main air intake can be seen at the base of the device. The supplementary air is admitted above the jet controlled by means of an annular brass plate with a plurality of ports, which in turn are controlled by phosphor bronze tension reeds; these are so adjusted and weighed that they rise progressively with the



Hawthorne tire pump to be placed on the running-board—cranks by hand

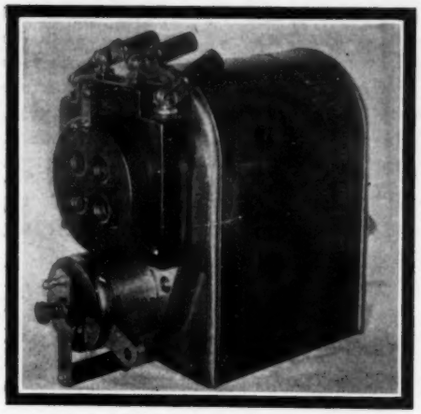


Illustrating the regular form of Mayo radiator, presenting a honeycomb appearance

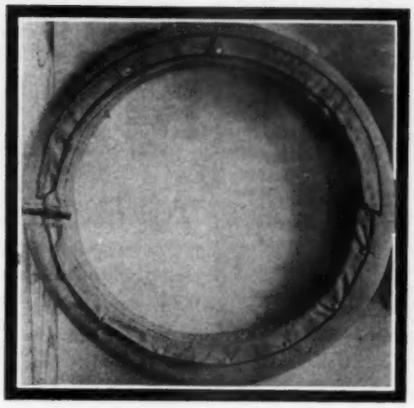


Old Sol type of headlight for use on runabouts—six-inch size for "gas"

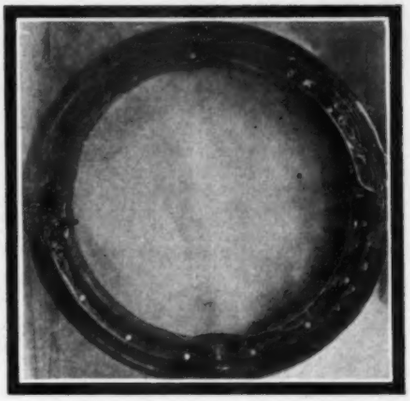
Bowers carbureter with single adjustment and venturi choke—concentric float



Connecticut magneto, showing "inspection window." This is a desirable feature

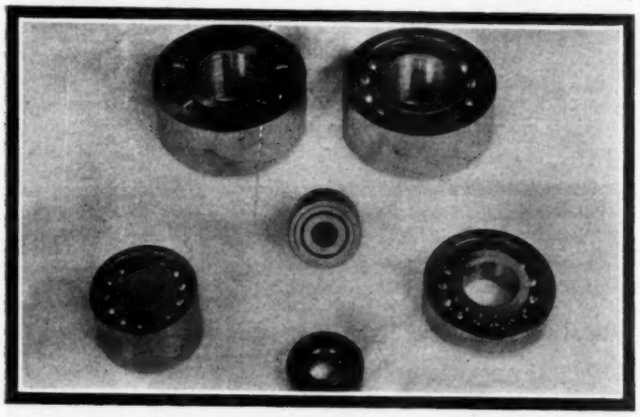


Gilbert tire cover made of mohair with a storm lap attachment



Gilbert tire cover of patent leather and designed to protect tires from weather

increased suction of the motor as the speed increases. By means of a split ring it is possible to turn the top of the carbureter round so that the position of the gasoline intake or the throttle lever position can be altered to suit any type of motor. The carbureter is compact and is provided with a flange connection



New Departure ball bearings, showing single, double and treble row types

to the intake manifold. It is manufactured by the Gilbert Manufacturing Company, New Haven, Conn.

Connecticut Magneto

This is a magneto of the conventional self-contained type, as shown in the illustration. The armature is of the conventional bobbin type, to which is attached a gear wheel to drive the distributor. It carries the primary winding, only the secondary being carried in a coil which is placed above the magnetic field between the magnets, which are encased to exclude dirt and moisture. The interrupter end of the armature shaft is fitted with steel pins which form cams, and as the armature is rotated these raise the hard fiber cam which cause the make and break at the platinum points. By swinging a small bar aside the entire interrupter can be detached and the points set if necessary and cleaned through a slot with a small file supplied with each instrument.

Ball bearings are used throughout, those carrying the armature being separable and those used on the distributor being double.

The spark gap is inside the distributor cover which is fitted with four small mica windows and through these it is possible to see which plug is not firing.

The magneto is manufactured by the Connecticut Telephone & Electrical Company, Meriden, Conn.

Gilbert Tire Covers

In order to protect the spare tire carried on the car it is necessary to have some wrapping and in choosing this the autoist should be careful to choose one that will withstand the ravages of the elements, which, of course, depends both on the material used in its production and on the excellence of workmanship.

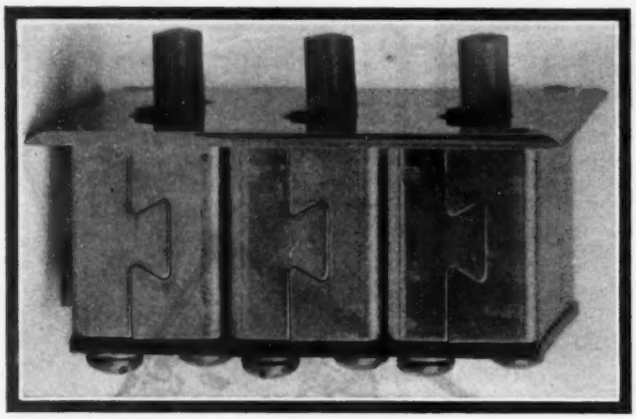
In the case in point it will be seen in the illustration that this is effected by means of a lapped ridge that covers the joint and as can be surmised this should be placed uppermost. The fasteners are of the snap button type and the seams are stripped, giving a tailor-made effect both out and inside. These covers are made in many different colors and material and those shown are in French gray mohair with leather piping and the other in black patent leather. These cases are manufactured in New Haven, Conn., by the Gilbert Manufacturing Company.

Mayo Radiator

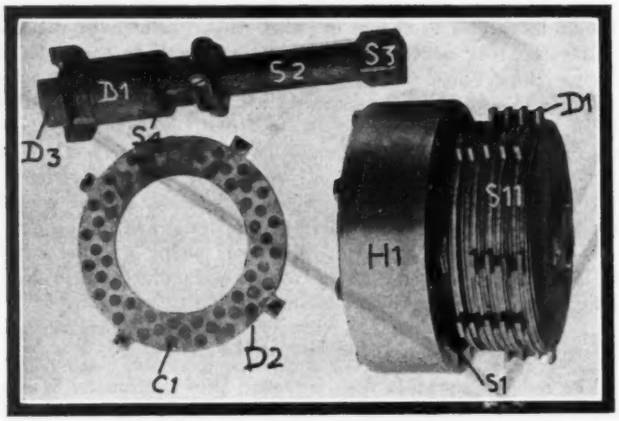
The radiator shown in the illustration is of the vertical honeycomb type with square cells. Besides this type several other types are manufactured with wire separators by the Mayo Radiator Company, New Haven, Conn.

New Departure Ball Bearings

A feature of the ball bearings manufactured by the New Departure Mfg. Co., of Bristol, Conn., is the separator used to separate the balls. The small bearing in the center of the group is of this style intended for use with magnetos. The bearing consists of a main two-way race and outside cups that are secured to the main body. The separator is in two halves with deep sockets for each ball. The sockets are of slightly greater radius than that of the ball itself, which allows lubrication to be retained around the ball. The separator is also designed to prevent wedging or cramping of the ball in moving along the path of rotation. The separator used in the single row is the same principle in construction and design as that used in the double row, but differs slightly in shape. In the single row bearing the two halves face each other, whereas in the double row they are back to back and the outer surfaces are beveled, while in the single row the two halves are riveted together. At the exterior of these bearings there is very little opening through which grit and extraneous matter can find its way into the bearing but is so constructed that a pocket of lubricant is formed around each of the balls. The two bearings shown in the upper part of the illustration depict two entirely new ball bearings that are being added to the New Departure line. They follow the idea of the radial and thrust type with a few differences of application. In one case the balls are pressed into the container through a slot and in the other the balls are separated by a winding separator which is made of phosphor bronze. Another type made by this concern that has found favor in small single-cylinder motors for crankshaft work is the three-in-one. It consists of a race with three ways and three rows of balls wherein all radial and thrust strains are taken up. These ball bearings are made in all of the regular sizes and are used for both thrust and radial work.



Diamond H treble switch used for electric lighting control—flush type



Premier clutch, showing application of "cork inserts" as furnished by the National Brake & Clutch Company

Diamond "H" Switch

These switches are intended to follow the idea that manufacturers of automobiles have incorporated into their models of the last few years, viz., to clean the dashboard of as many fittings as possible. Of course switches for the electrical connections can be placed in other spots besides the dash, but then they are not so handy and accessible. The switch here depicted is made to fit flush with the dash and besides being unobtrusive is an ornament.

The switch is designed for low voltage work and is operated by two push buttons of different colors, one black and the other white.

The switch shown can be used with the electrical lighting system, the connections being made inside the hood. It has a quick make and break and the mechanism is insulated from the current carrying parts by sheet mica. It is made in single, double, treble and quadruple gangs by the Hart Mfg. Co., Hartford, Conn., who have recently moved into a new and well-fitted-out factory building.

Cork Inserts

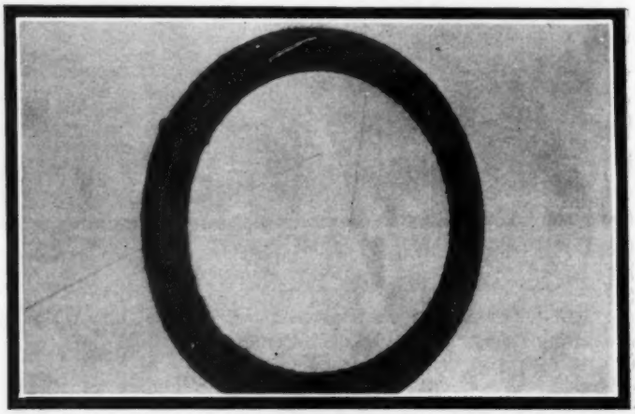
The multiple-disc clutch shown has a housing H1, which is provided with inverted splines S1 to accommodate the driving extensions D1, and springs S11 are placed between the respective discs for the purpose of separating them when the clutch is disengaged. One of the clutch discs D2 is shown at the left with cork inserts C1 occupying about 20 per cent. of the total area. The clutch shaft S2 has a square end S3 and integral splines S4 with a spline block B1 and dogs D3. There are 21 plates having cork inserts and the housing H1 is oil-tight into which oil is placed for the purposes of lubrication. Cork is the lightest known solid and possesses the quality of altering its volume to a marked degree under pressure. In the construction of clutch plates the cork is allowed to protrude slightly above the surface of the material. Besides the application of cork inserts for plate clutches the National Brake & Clutch Co., of State street, Boston, Mass., manufactures leathers for cone clutches with cork inserts as well as brake shoes.

Materials for Brake Linings and Disc Clutches

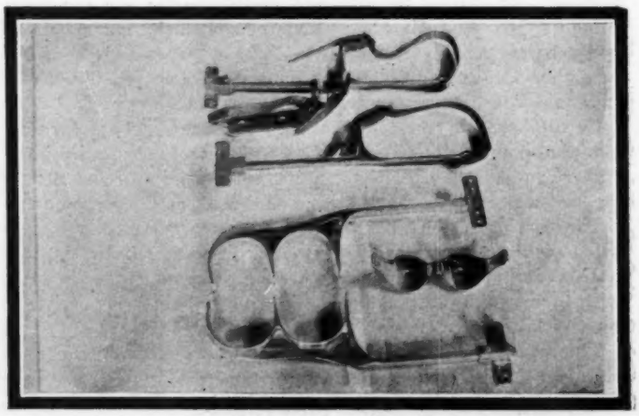
Raybestos is a fabric made from asbestos spun on strands of wire and then woven to form an integral piece, doing away entirely with lapping, sewing or threading. After being woven it is subjected to treatment which increases the coefficient of friction. The circular piece shown is used for disc clutch work. Besides this it is largely used on cars for brake linings and on cone clutches in place of leather. It can be drilled and countersunk with the same tools used on metal. The makers claim that it is impervious to heat, oil or gasoline. It is manufactured by the Royal Equipment Co., Bridgeport, Conn.

Gilbert Spare Tire Brackets

The Gilbert brackets here shown (in the lower part of the illustration), are for use with spare tires in covers or otherwise. They are strongly made with feet for attaching them to the body and dashboard of the car. By means of a set screw the irons proper can be turned to any angle to suit circumstances and can also be removed in a few seconds if desired. The brackets in the upper part of the picture show the type used for detachable rims fitted with tires. These allow a certain amount of expansion or contraction and are secured in place by straps. They are manufactured by The Gilbert Mfg. Co., New Haven, Conn.



Raybestos heat-proof fabric used for clutch and brake facing work



Gilbert tire irons for plain and quick-demountable tires